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NATURAL HISTORY

July-August
1929

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RINGING THE TIGER

JOURNAL OF THE AMERICAN
MUSEUM OF NATURAL HISTORY
NEW YORK, N. Y.

THE AMERICAN MUSEUM OF NATURAL HISTORY

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VOLUME XXIX
NUMBER 4

NATURAL HISTORY

JULY-AUGUST
1929

The Journal of The American Museum of Natural History

HAWTHORNE DANIEL
Editor

A. KATHERINE BERGER
Associate Editor

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Published bimonthly, by The American Museum of Natural History, New York, N. Y. Subscription price $3.00 a year.

Subscriptions should be addressed to James H. Perkins, Treasurer, American Museum of Natural History, 77th St. and Central Park West, New York City.

NATURAL HISTORY *is sent to all members of the American Museum as one of the privileges of membership.*

Entered as second-class matter April 3, 1919, at the Post Office at New York, New York, under the Act of August 24, 1912.

Acceptance for mailing at special rate of postage provided for in Section 1103, Act of October 3, 1917, authorized on July 15, 1918.

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A JAPANESE SAILBOAT IN THE SHADOW OF FUJIYAMA

Despite the fact that the Japanese and Chinese have been adept sailors, they have played no great part in the modern development of ships. Long ago they developed boat- and ship-building to a point far in advance of the other peoples of the Orient, but, until they came into commercial contact with the Occident, they built no ships comparable with those that have been developed by Europeans and Americans

See "Afloat on Many Waters" Page 353

VOLUME XXIX

NATURAL HISTORY

NUMBER FOUR

JULY-AUGUST, 1929

TIGER HUNTING IN NEPAL

How, on the Grass-covered Plains at the Foot of the Himalaya, Tigers Are Captured by Surrounding them with Numerous Hunters and Beaters on Elephants. A First-hand Account of a Hunt

By WILLIAM J. MORDEN

Field Associate, Mammal Department, American Museum

All tigers, wherever they may range, belong to the same family, though they are subject to considerable variation in size, coloring, and pelage. Those of the Amur River district, to which Mr. Morden is shortly to lead an expedition to collect these animals, are generally conceded to be the largest of the family—huge, long-haired beasts with a noticeable amount of white on underbodies, sides, and faces. They are considerably larger than the southern Asiatic tiger of today, and closely allied with them are the tigers of the Manchurian forests, while the Korean variety, also long-haired, is somewhat smaller. In southern Asia, due to the warm climate, the tiger is a short-haired animal, and in addition differs somewhat from his northern relatives in size and coloration. It is of these tigers that Mr. Morden speaks in the following article. There are, of course, no tigers to be found in Africa.—The Editors.

TIGERS are usually associated with India, although as a matter of fact they are quite widely distributed throughout Asia. They are found in the Caucasus, northern Persia, portions of central Asia, China, Manchuria, Mongolia, southeastern Siberia, Korea, and the islands of Java and Sumatra, though in some of these localities they are not numerous. They are hunted also in Indo-China, in Siam, and in the Malay States, although not to the extent that they are in India. It is only with the Indian tiger, however, that this article will deal, for it is south of the Himalaya that I have hunted them.

They are, of course, large and powerful beasts, and there have been many records of Indian tigers measuring more than ten feet in length, but it seems probable that these measurements were taken along the curve of the back, rather than in a straight line from nose to tip of tail. It is now pretty generally accepted that a ten-foot Indian tiger, measured in a straight line from tip to tip, is a large specimen. Tigresses are somewhat smaller; a tigress of nine feet is unusual. The average weights of tigers and tigresses are about four hundred pounds and three hundred pounds, respectively, though tigers weighing more than five hundred

THE CAMP OF LT. COL. SIR FREDERICK O'CONNOR, BRITISH ENVOY TO NEPAL
Mr. and Mrs. Morden were the Envoy's guests for a week at this camp while the "tiger shoot" described in the accompanying article took place

pounds have been known. A full-grown tiger will stand about forty inches at the shoulder.

Aside from sources of food supply, the necessary requirements of the tiger in hot countries are a sufficiency of water and protection from the sun, and these requisites are found fairly generally throughout India, except in the deserts of the Northwest Frontier, the Sind, and parts of Rajputana and the Punjab. Although they have been killed off in some districts, tigers, generally speaking, are found all over the Indian Peninsula and even into the foothills of the Himalaya. Dense forests, bush and scrub growth, and areas of high grass form the favorite haunts of the tiger; he is almost never found in open country or far from good cover.

A tiger's senses of hearing and sight are both wonderfully acute, though it is on his ears that he mainly relies for detecting the presence of game. His sense of smell, on the other hand, is much less sharp, and in questing after game he does not scent along the trail as do members of the dog family, but locates his quarry almost entirely by hearing.

In Mr. A. A. Dunbar Brander's excellent book entitled *Wild Animals in Central India*, the author tells of experiments with a tame tiger which he kept for some time. When this animal's food was taken away from him and dragged through the grass, he never attempted to follow up the trail by scent, but hunted around in circles until he came upon it. As Mr. Dunbar Brander very aptly puts it, "Animals develop this sense (i.e., smell) either to hunt game, get their food, or for self protection. None of these causations apply to the tiger. They find their game by their ears and eyes, and having stalked it, they rush upon it. . . . They have been 'top dog' in the country they inhabit for

so long, their strength and ferocity have been all the protection they required."

Aside from the occasional man-eaters, which are usually old animals or ones that have been partly crippled by wounds or disease, the tiger varies his food according to the district in which he lives. Where game is plentiful, as it is in much of Central India, he preys on denizens of the forest such as the sambar, chital, nilgai, and pig. When game is scarce, however, tigers often take to killing cattle, and then they become great nuisances. A full-grown tiger will average about a hundred kills a year, so it may easily be seen that, in districts where tigers are numerous and are inclined to prey upon herds of domestic cattle and buffaloes, they prove a source of heavy loss to the inhabitants.

Such is the situation in parts of the Terai, the flat area of forests and high grass that extends along the southern foot of the Himalaya in Nepal and Bengal. It was there that I was so fortunate as to be a guest at a tiger-shoot given by the British Envoy to Nepal. This independent state, which lies between India and Thibet, is closed territory to foreigners, and very few have been able to shoot there. I believe, furthermore, that the method of tiger-shooting in Nepal is peculiar to that country. Briefly, it consists of surrounding the tiger with a ring of elephants, some of which carry the shooters in houdahs on their backs. The procedure is as follows:

Word comes that a tiger has made a kill, sometimes but a short distance away, but more often several miles from camp. Mounted on fast riding elephants, the camp's native shikaris, or hunters, ride out to inspect the kill, and if it seems probable that the tiger is not far away, word is

TEA AFTER THE DAY'S SHOOTING

The party included the Envoy and his aide, the Legation surgeon and his wife, Mr. and Mrs. Morden, and a photographer. During the hunt about six hundred natives and more than fifty elephants were employed

THE WORKING ELEPHANTS LEAVING CAMP
When the shikaris learn of a kill by a tiger, the working elephants are sent out to form the ring around the kill

sent back to camp. Then the so-called working elephants go out, each in charge of his mahout, or driver, with usually another man sitting on the pad, or mattress, tied over his back. With the working elephants go also the houdah, or shooting, elephants, which carry the box-like houdahs on their backs. These are the mounts of the shooting party, and they are always huge, steady, well-trained fellows, from the top of which one can get a good view over the tall grass or through the thick undergrowth. Altogether, about fifty or sixty elephants go out in the working party, and they make a striking picture as they file away from camp and trail off into the forest.

The members of the shooting party allow the others a head start, depending on the distance from camp that the kill has been reported, and then follow on "pad" elephants, which are smaller, faster, and more easy riding than the big houdah carriers. Usually, the ring has been partly formed when the second party overtakes the first, and then a transfer is made to the houdahs. If there is a great difference in size between one's two elephants, the mahout of the larger makes him kneel, so that one may simply step from the back of the pad elephant into the houdah. After the transfer, all the elephants take their places in the ring, with the houdah-carriers located at advantageous points. The size of the ring depends upon the terrain; in the flat areas of high grass where our tigers were found, the ring was usually about three hundred yards in diameter at first. This distance is gradually reduced as the work of dislodging the tiger progresses. Somewhere inside the ring lies the kill and, one hopes, the tiger.

The reason why a kill may be surrounded with the reasonable certainty that the tiger is not far away, is the beast's habit of gorging, then drinking and sleep-

A WORKING ELEPHANT

This photograph was taken in the dense grass of the Nepal terai. It is such cover as this that would make it impossible to locate a tiger if the hunter were on foot

MRS. MORDEN ON HER RIDING ELEPHANT

When the working elephants go out, the houdah elephants, which are slow and hard riding, go with them. The party follows on smaller, faster elephants

THE PARTY GOING OUT
An hour's start has been given to the working and houdah elephants. When the party catches up, a transfer will be made to the houdahs

ing. Where kills are found far from water, there is little likelihood that the tiger will be lying-up near by, for after his drink he will seldom move far before sleeping. So expert do the native shikaris become in judging the chances of there being a tiger near the kill, that in a total of nine rings formed during our week in Nepal, tigers were found in the seven of them —and on two occasions there were three in the ring at once.

After the circle of elephants is completed, two or three near each houdah carrier are brought forward and worked back and forth in front of the line, to trample down the high grass so that it may be possible to see the tiger, should one come that way. I had never realized how impossible it would be to find a tiger on foot in such country, until I viewed those great stretches of grass from the vantage of a houdah. From the ground I could see only two or three feet in any direction; even when I was mounted on my elephant's back, the grass-tops, in many places, rose above my head.

The trampling out of a "field of fire" is the last operation in the forming of the ring. Shouts from all sides announce that all is in readiness, and a general tenseness becomes noticeable among the mahouts. The shooters take their weapons—usually double-barreled shotguns loaded with ball, to lessen the possibility of dangerous ricochets in case of misses—and stand to. Orderlies in the rear compartments of the houdahs hold the second guns in readiness, in case the tiger comes close and more than two shots are needed. Then, into the high grass in the center of the ring go two or three elephants, guided by their mahouts. These animals are always old timers, ones who know tigers and are not to be bluffed by them. Ordinarily, a tiger will not attack an elephant, though when hard pressed or

wounded he may spring at one. The elephants seem to enjoy the fun of rounding-up tigers, and although they often show excitement when the tiger comes close, I have never seen one exhibit fear. Once, however, a hare broke through the line and the elephants on both sides nearly stampeded.

The elephants moving about inside the ring go "whooshing" here and there, tearing up great trunkfuls of grass and generally making as much noise as possible. The mahouts know that the densest cover will most likely hold the tiger, and they guide their mounts toward the thickest places. The tension around the ring becomes greater, and all ears are strained for the first sound which may indicate the quarry's location and his probable line of retreat. Sometimes the tiger is dislodged almost at once; more often it seems that every foot has been covered and that nothing larger than a mouse can have escaped being trampled.

Suddenly, from behind one's back comes the excited voice of the orderly, "Bagh hai, sahib, bagh hai." ("Tiger, sir, tiger!") The man's trained eye has caught a movement in the grass, to which he points with trembling finger. A moment only, then a snarling roar and a movement of the grass as the tiger, aroused from sleep and thoroughly angry, dashes for a place of greater concealment. You follow his movements by the line of moving grass-tops and stand ready, leaning over the front of the houdah in case he breaks cover near by. If he does come your way, a snap-shot from the swaying houdah at a plunging yellow streak in the grass far below is all that you will get, unless, as sometimes happens, the first shot turns him and he dashes along the trampled area inside the ring.

Should he strike the ring at a point where there are no guns, the elephants, trumpeting and squealing, let him pass between them. After he has passed, the mahouts on each side of the break turn their steeds and parallel his line of retreat, keeping track of his movements by the telltale shaking of the grass-tops.

TWO OF THE PARTY IN A HOUDAH
A mahout, astride the neck of his elephant, and an orderly in the rear compartment of the houdah make up the elephant "crew"

RINGING THE TIGER

As many as forty or fifty elephants may start out in two groups, one walking to the left, the other to the right until the two leaders meet, thus completing the ring

A BENGAL TIGER IN CAPTIVITY

Tigers in the wild state are likely to be stronger and heavier than specimens to be seen in zoos, due to their more active lives

THE DEFENSE GUARD

In case the tiger breaks through the ring, his line of retreat is paralleled by the elephants on each side of the break, and when he stops, another ring is formed

MR. MORDEN IN HIS HOUDAH

In this photograph the mahout is hidden by the houdah. Sometimes, as in this case, an extra man rides behind the houdah to speed the elephants if he lags

THE RING CLOSES IN

After a tiger is shot, the ring closes in. A wounded tiger sometimes takes cover in particularly heavy growth, and then it may become dangerous to the elephants and difficult to dislodge

A SHOT AT SHORT RANGE

A wounded tiger has broken cover and Mrs. Morden in the foreground has just fired at him. Mr. Morden is taking aim

TRYING TO DISLODGE A TIGER
It is typical of tigers to take cover rather than to run any great distance. Thus the method of ringing them is usually successful

When he stops, which he does at the densest bit of growth, they surround the place and a new ring is formed. Were the tiger to keep going, he would probably get away, but his instinct for concealment is his undoing.

Sometimes, as happened to our party on two successive days, more than one tiger may be found in the ring. Then ensue a few seconds of the greatest excitement, for they almost always break in different directions. Guns pop, elephants squeal, and mahouts shout on all sides, two or three tigers dash through the ring and are followed by lines of racing elephants. It is an experience never to be forgotten.

When a tiger is killed, the ring is gradually closed in until it is but a few yards in diameter. Then, after making sure that the animal is dead, the mounts of the shikaris and those of the sahibs are made to kneel, and the prize is examined. Before the beast is moved, however, the head shikari makes puja—literally, "worship"—a ceremony which is performed after each kill. The shikari takes five blades of grass, dips them in the tiger's blood, and casts one to each point of the compass; the fifth he buries in the ground, all the while uttering a sort of incantation. Thus the gods of the jungle are appeased and good hunting is assured for the future.

One of the most interesting features of the Nepal tiger shoot on which I went was the elephants, which were loaned by the Maharajah of Nepal and the rajahs of neighboring states. To say that one becomes fond of one's hathi, is to put it mildly. They are such amazing brutes, clumsy in appearance, and yet remarkably quick and intelligent. In moving along a forest trail, a low-hanging branch or creeper may look as though it would brush the mahout and his passenger off the elephant's back. You prepare to

BEGINNING OF MAKING *PUJA*

A ceremony of propitiation is performed by the shikaris after a tiger is killed. Five blades of grass are dipped in the tiger's blood, one is thrown to each of the points of the compass, the fifth is buried in the ground.

THE RETURN OF THE SHOOTING PARTY

For return to camp a transfer is made from the houdah elephants to the riding elephants on which long distances may be covered without discomfort as their motion is easy on the rider. Their average traveling gait is about five miles an hour.

bend as low as possible, but just before reaching the obstruction, the elephant stops, and you see his trunk reach up, curl around the limb, tear it down and throw it aside. Again, a tree of considerable size may bar your path. Your mount just leans his head against it, his trunk curled; an easy push and over goes the tree.

On arrival at camp after the day's work, it is customary for the rider to give his mount a piece of sugar cane, and one of the camp attendants is always on hand with a bundle of short lengths for the purpose. Hathi knows about how long it should take you to dismount and get his present, and he waits quietly until he thinks the time is up. Then he becomes impatient and "whooshes" about with his trunk until the titbit is forthcoming.

Each elephant has its own personal servants, four of them. The mahout, who rides on his neck and guides him by prodding him with bare feet behind his ears, is usually a man who has grown up in the elephant service and thoroughly knows his mount. Mahouts seldom speak loudly to their charges, but seem to do most of their guiding by low-voiced orders and by their toes. Now and then a mahout will bring the blunt edge of his kukhri (the curved Gurkha knife which they all carry) down on an elephant's head with a crack that one would think would fell the animal. The blow does not seem to hurt the elephant, however, who just shakes his head a bit—and usually does what is required of him without further ado.

One of the three other men assigned to each elephant might be termed his groom, for this man sees that his animal is properly bedded down at night—they are always kept chained in camp—that he is watered, fed, and generally looked after. The other two men cut grass during the day and pile it up in bundles, which are brought to camp by the elephants themselves when they return from their day's work.

Although in some districts, where game is plentiful, tigers serve to maintain a

A TYPICAL TUSKER

The houdah elephants are large and specially trained for their work. Due to this training they are not likely to become excited at critical moments

balance of nature and prevent undue multiplication, in others they are malicious marauders. In the Nepal Terai, natives came to us and begged us to hunt near their villages, where, they said, tigers killed enough of their herds to cause real hardship. Nor are these natives usually able to protect themselves.

Tigers undoubtedly play an important part in the economic life of India, for they serve to keep down the numbers of other animals that tend to destroy the native crops. It is not likely, therefore, that the government will permit them to be exterminated. Where, however, they prey too extensively on domestic herds, it is highly desirable that their numbers be reduced, for thus, and thus only, can the proper balance between wild life and agriculture be maintained.

BRINGING IN A SUPPLY OF FODDER

Each elephant daily consumes several hundred pounds of leaves and smaller branches. This fodder is cut by two of the four men assigned to each mount and is collected and brought to camp by the animals after the day's work is over

Publishers Photo Service

AFLOAT ON MANY WATERS

A Photographic Series Showing the Steps by Which the Primitive Boats of Widely Differing Peoples Have Been Developed from Floating Logs to Built-up Boats, the Forerunners of the Ships that Ultimately Aided the White Man in His Domination of the Habitable Earth—Some of the Many Types that Are in Use Today as They Have Been Since Before the Dawn of Written History

LONG before the dawn of history lived the first sailor. Who he was we do not know. Where he lived we cannot even guess. Probably in a thousand different places at a thousand different times a thousand different ape-men found that by sitting astride floating logs they could ride upon the surface of the water. Such, undoubtedly, was the beginning of seamanship, and yet that first step could hardly have been a conscious one. It is not likely that it was a clearly recognized discovery. It seems more probable that it was merely an accepted fact even with the earliest of mankind.

Finally, however, this bit of information was improved upon, for some long-forgotten genius ultimately learned that by using a stick he could propel his log in the direction he wished it to go, so long as he could reach the bottom of the shallow waters upon which he was willing to risk his naked body. Later, probably, this inventor's descendants learned that by lashing lighter logs together they could be made into craft more easy to propel—more comfortable—more fitted to carry these early sailors and their meager belongings.

These steps, of course, simple though they were, were long in coming. Even today there are primitive folk to be found in the world who do not construct boats—whose wanderings on the water are limited

Wide World Photographs

ONE OF THE MOST PRIMITIVE CRAFT IN USE TODAY

Built of a few slender saplings lashed together, this South American raft forces the navigator to sit in the water. Naturally with such equipment, the natives spend little time on the water, and therefore have not developed into sailors

A PERUVIAN "BALSA"

This boat-shaped affair is actually merely a raft, although it has been developed far beyond the stage of the other raft shown above. The craft is built of several cigar-shaped bundles of reeds lashed together

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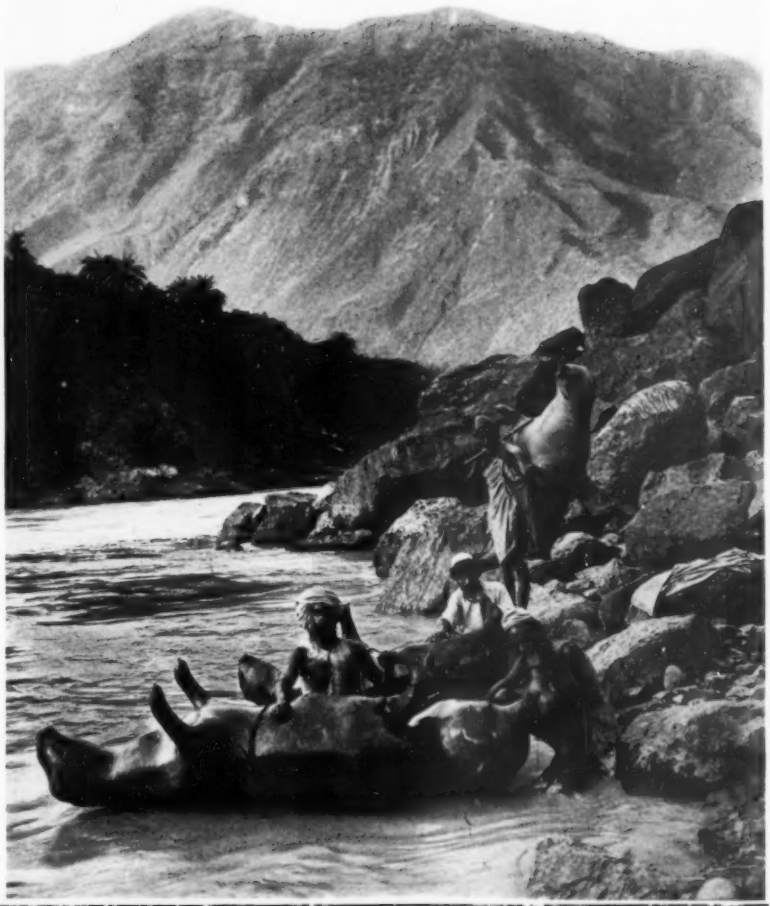
INFLATED SKINS USED AS BOATS

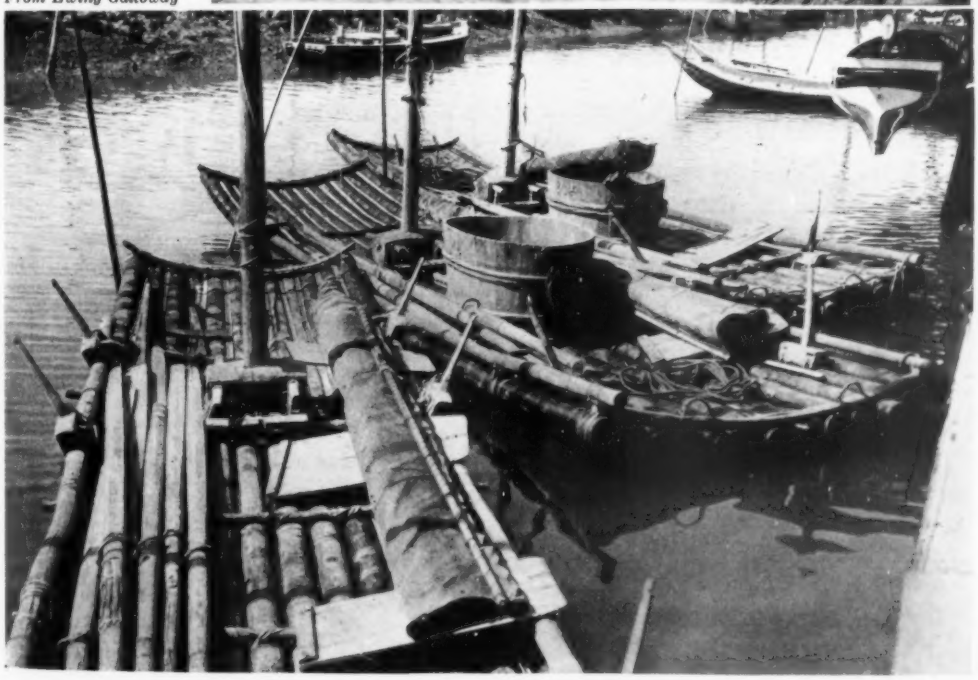
Even today these ingenious floats are still in use on some Asiatic rivers, just as they have been for thousands of years. When Alexander the Great entered Asia, his soldiers sometimes used such floats in crossing the rivers



FORMOSAN RAFTS

These bamboo rafts are highly developed and thoroughly practical craft. In Formosa, where this picture was taken, many oyster fishers prefer them to small boats

By Burton Holmes
From Ewing Galloway



Photograph by Carl E. Akeley

A PRIMITIVE AFRICAN DUGOUT

These natives have hollowed out the log but have not otherwise changed it. It is a present-day counterpart of boats known and used in prehistoric times

by the simple rafts that they still use. In South America, for instance, a tribe called the Cuiapo Pihibi navigate the streams that flow into the upper Orinoco on rafts so small that the navigators sometimes sit immersed in water to their waists. Naturally, with such equipment, they spend little time on the water and have never become adept sailors.

Ultimately, in many parts of the earth, the size of such rafts was increased until they were capable of bearing greater weights and more men. The water, however, still tended to wash across the logs, and consequently low platforms were built upon which the navigators could ride, keeping themselves and their belongings above the wash of the waves. Even so advanced a people as the early Greeks used "boats" such as these at the time Homer wandered blindly up and down their land.

Still other peoples even learned to hollow out the larger logs—with fire, perhaps, and crude stone tools—and thus they constructed dugouts—the first real boats. They learned, too, to make and use paddles, and were thus no longer limited to the shallow waters where they could pole their crude and awkward vessels.

Dugout canoes have many advantages over rafts, and almost wherever trees of sufficient size were to be found, dugouts at some time or another have been built. Even today the dugout is one of the commonest of boat forms and can be found in use in hundreds of widely separated districts of the world.

It may be, too, that the hollowed log finally suggested the use of the curved bark of the tree as a boat, and in South America today one may occasionally find a form of bark canoe that, undoubtedly, is the simplest of all such craft. The

American Museum Photograph

MORO BOYS IN TINY DUGOUTS

In many parts of the world dugouts are in every-day use. Moro boys are familiar with the water almost from the time they can walk, and have their own boats in which they play about the villages that are built on piles in shallow water

BUILDING A SEA-GOING DUGOUT

The Javanese, as well as other peoples of the South Seas, are adept at constructing large seaworthy dugouts, in which they sometimes make long voyages across the open sea

Brown Brothers

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SOLOMON ISLAND WAR CANOES

The designs and decorations of the vessels of many primitive people are striking and unique. Each of these war canoes is large enough to hold as many as sixty men

A BRITISH COLUMBIA WAR CANOE

The Indians of the British Columbian and Alaskan coasts are adept workers in wood, and their dugout canoes are beautiful examples of their art. So seaworthy are these boats, that, a number of years ago, Captain Voss, a Canadian, sailed a forty-foot canoe of this type 40,000 miles from British Columbia through the South Seas, around the Cape of Good Hope and north in the Atlantic to England

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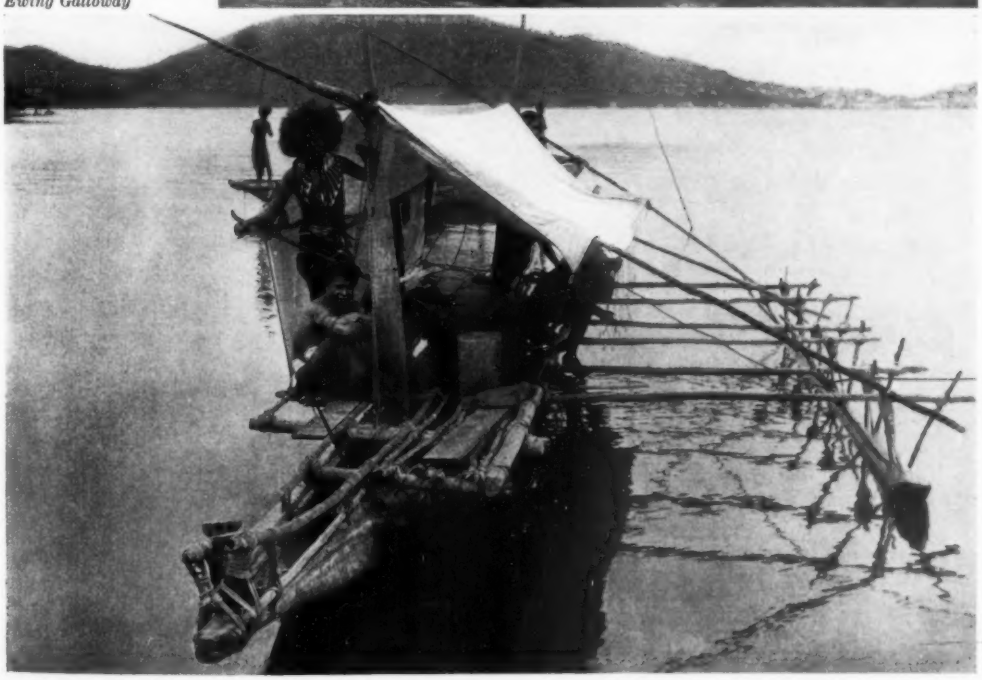
A TAHITIAN OUTRIGGER CANOE

Many natives of the Pacific Islands build dugout canoes that they fearlessly use in rough water. In order to give the canoes more stability an "outrigger" is attached

PORT MORESBY, NEW GUINEA, OUTRIGGER CANOE

This photograph shows clearly how an outrigger operates. The boat is so narrow that platforms are built out on each side, and the balance of the whole is kept by the outrigger that floats far out at one side

Ewing Galloway



American Museum Photograph

AN OLD SAMOAN STATE CANOE

Chiefs of native Pacific tribes often possess very large and highly ornate canoes. This Samoan craft is an outrigger canoe built especially for use on important occasions. Often outrigger canoes have outriggers on each side. This is particularly true when they are intended to carry sail

Carapuna Indians of the Amazon Valley sometimes cut the bark from a tree—a section eighteen or twenty feet long—and this bark, naturally, tends to remain curled up as a scroll is curled. With a few sticks they spread it halfway between its ends, and thus create the very simplest of bark canoes, for the ends tend to remain rolled up, and with the weight of the passengers amidships, the ends tend also to rise above the water level.

Such a canoe, of course, cannot be strong, and the next step in its development is a frame to stiffen the pliable bark. Such a frame naturally is subject to considerable refinement, so, eventually, these crude bark canoes were brought almost to perfection in the birch bark canoes used so widely by the Indians of North America. Here a frame supports the weight of passengers and freight, while a covering of bark keeps out the water. With this development, mankind had made a tremendous step toward the ultimate construction of ships.

In many portions of the world, however, trees and bark are scarce, and other methods were developed. Basket-like "boats" were woven, and in order to make them float, they were daubed with pitch. Such boats—still merely overgrown baskets, oval or circular in shape—are used to this day on the Tigris and Euphrates rivers and elsewhere. The Mandan, Sioux and other Indians, who formerly lived in South Dakota, also made circular boats, quite similar in shape to those of Mesopotamia, but they were circular frames covered with hides, instead of baskets daubed with pitch. The Eskimos, more dependent upon the water than the Mandans, learned to construct more refined skin-covered boats, and even today the kayak and the umiak are in

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BIRCH BARK CANOES

No more nearly perfect light boat has ever been developed by primitive people. These canoes, built of birch bark over a light but sturdy frame, were formerly widely used by many American Indians. So thoroughly practical was their design, that the white man duplicates them in wood and canvas, and uses them in large numbers

THE CRUDEST TYPE OF BARK CANOE

The crudest of bark canoes is shown beside a white man's canoe that has been built of wood and canvas in imitation of the North American Indian's birch bark canoe

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A CIRCULAR BOAT ON THE EUPHRATES

These strange craft are merely large circular baskets. In order to keep the water out, the basket work is daubed with pitch or any other material that will serve. They are much used in Mesopotamia

THE ESKIMO KAYAK

Where bark is scarce, natives have developed boats covered with other materials. The Eskimos commonly use skins stretched over frames of wood or bone. A "kayak" takes the form of the one shown here; a larger, open boat, they call an "umiak"

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A NILE RIVER "DHOW"

Though sails were in use before the dawn of history, apparently these graceful "lateen" sails were not used until about the time the followers of Mohammed conquered Egypt

AN OUTRIGGER CANOE UNDER SAIL

This Philippine "prau" requires two outriggers in order to offset the pull of the sail

American Museum Photograph

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A PRIMITIVE BUILT-UP BOAT

For thousands of years built-up boats have been lashed together as is this boat from the Bay of Bengal. The lashings are often made inside, but boats of this type either have no frames at all, or have simple frames placed inside as strengtheners after the planks have been lashed together. Not until this type of construction was developed, were boats of considerable size possible

common use. Elsewhere in the world, too, boats of similar construction have been used, but such construction does not permit of much increase in size, with the result that larger craft could not be built until wooden planks and finally steel plates came to take the place of skins and bark.

It was the desire for larger boats—for mankind early turned to trade and needed means of water transport—that taught someone, somewhere, to increase the seaworthiness of his dugout canoe by the addition of boards along the sides. Thus he could carry heavier loads without lowering his canoe so deep in the water as to risk the loss of cargo and life. Such boats, too, were ultimately perfected, until the original dugout became merely the keel, while the planks that had originally served only as additional "freeboard" served now as integral parts of the hull. Such construction made boats of considerable size possible, even though the planks were tied together at first with thongs.

These thong-tied boats then gave way, in large part, to boats fastened together with pegs made of wood, which were in common use on the Nile two and even three thousand years before the dawn of the Christian Era. This method is still widely used, and "treenails" are to be found in many wooden boats, and even in wooden ships of considerable size.

During all this tremendously long period of development, the propulsion of boats had been making progress just as hull construction had been. Poles were succeeded by paddles, and paddles by oars which, having appeared, were the most important means of propulsion for thousands of years. Today, of course, we think of paddles and oars as the means of propulsion only for small boats. In ancient and medieval times, however,

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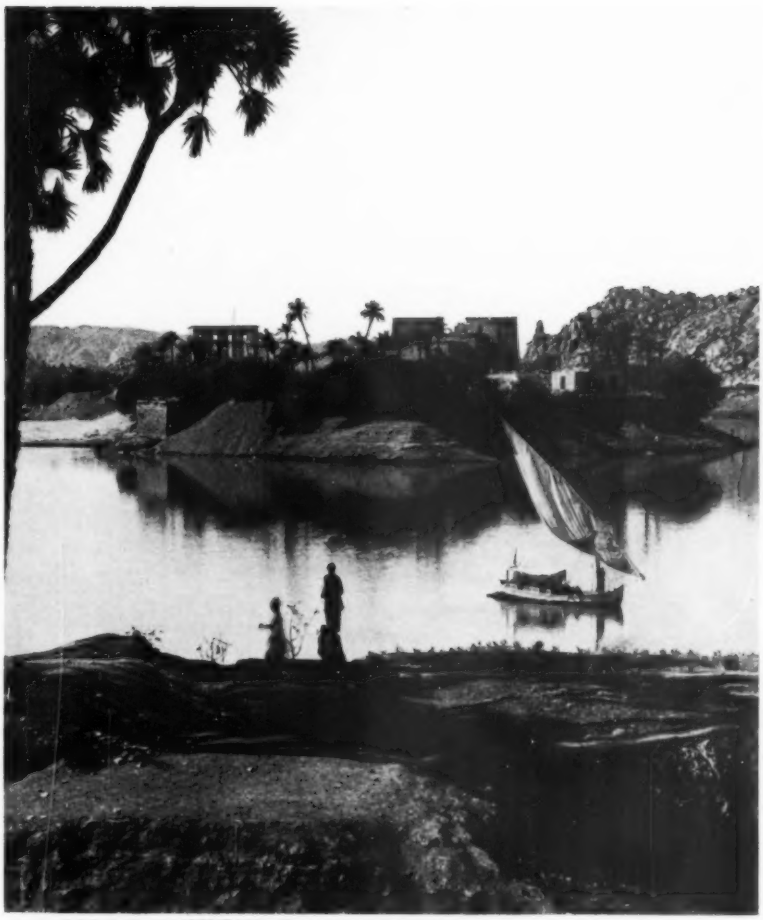

A NILE RIVER BOAT AT PHILÆ

The earliest known historical records of boats are those found on the ruins of Egyptian temples, though boats were well developed at that time, as is witnessed by the fact that together with some of the very earliest records of boats are accounts of naval victories over invaders who, even then, had endeavored to raid the Egyptian coast

A NATIVE BOAT, CALCUTTA

The resemblance between the hull of this Hoaghly River boat and the hulls of those in use on the Nile three thousand or more years ago is startling

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A SAILBOAT OF LOWER BURMA

The divided mast of this boat is very similar to the masts often used by the early Egyptians. The sail on this boat could not, by any chance, serve to propel the boat "into" the wind

ON THE PEARL RIVER, CHINA

For thousands of years Chinese junks and sampans have been used in much the same form in which they are found today. Awkward though most of the vessels seem, many of them are remarkably seaworthy. On more than one occasion Chinese junks have crossed the Pacific Ocean

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A CHINESE JUNK UNDER SAIL

A favorite and very disconcerting habit of Chinese seamen is to sail their awkward boats across the bows of steamships, steering as close as possible, in order that the steamer may cut off the devils which apparently are forever pursuing these far-eastern vessels

SMALL BOATS OF ASIA MINOR

When the Crusaders brought their north European ships out to Constantinople, to Asia Minor, and Palestine, they found that the peoples of these lands had many nautical improvements to offer. As a result the ships of England, France, and the Low Countries were greatly improved

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seagoing ships—some of considerable size—were propelled by oars, many ships being rowed by hundreds of slaves chained inhumanly to the crowded rowing benches.

Long before the earliest history, sails were widely used, although, strangely enough, among the peoples of North and South America they were almost entirely unknown at the time of Columbus. In two or three widely scattered and very limited districts American Indians did use the sail, but very little. Even the Aztecs, highly civilized though they were, had no understanding of the sails that propelled the ships used by the Spaniards.

In European and Asiatic waters, on the other hand, sails had been in use for thousands of years, though, until the introduction of the compass, few voyages were made far out of sight of land. The Vikings, of course, crossed the Atlantic, partly under sail and partly by using oars.

But few sailors were so daring as the Vikings, and so far as those of the Mediterranean were concerned, their voyages were almost wholly close along the shores of their own landlocked sea. Still, the commerce of the Mediterranean was great, and many were the ships that were built upon her shores. Thus, in the thousands of years of civilization that preceded the days of Prince Henry the Navigator and Columbus, on the very waters that washed the shores of the lands where these two men were born, the craft were developed that ultimately made possible the Era of Discovery that preceded and resulted in the era of European expansion and the development of the modern world.

Today we sail the Seven Seas on ships so amazing as to surpass the wildest dreams of the old navigators, yet here and there about the world are to be found counterparts of the very boats upon which the early development of mankind so largely rested. Rafts, dugouts, and bark canoes marked some of man's very earliest steps toward civilization and the mastery of the world, yet we have them with us still. The gap between the dugout of the savage and the palatial liner of the North Atlantic seems almost immeasurably vast, yet the one is but the outgrowth of the other. From one the other has evolved through the medium of the restless, never satisfied, and clever mind of man.

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A present-day replica of a Viking ship.—In a vessel of this type Leif Ericsson voyaged to America. Probably the sail was introduced to the Norsemen by the Roman conquerors of Britain

Claudia often rested by straddling a horizontal limb

THE CONQUEST OF CLAUDIA

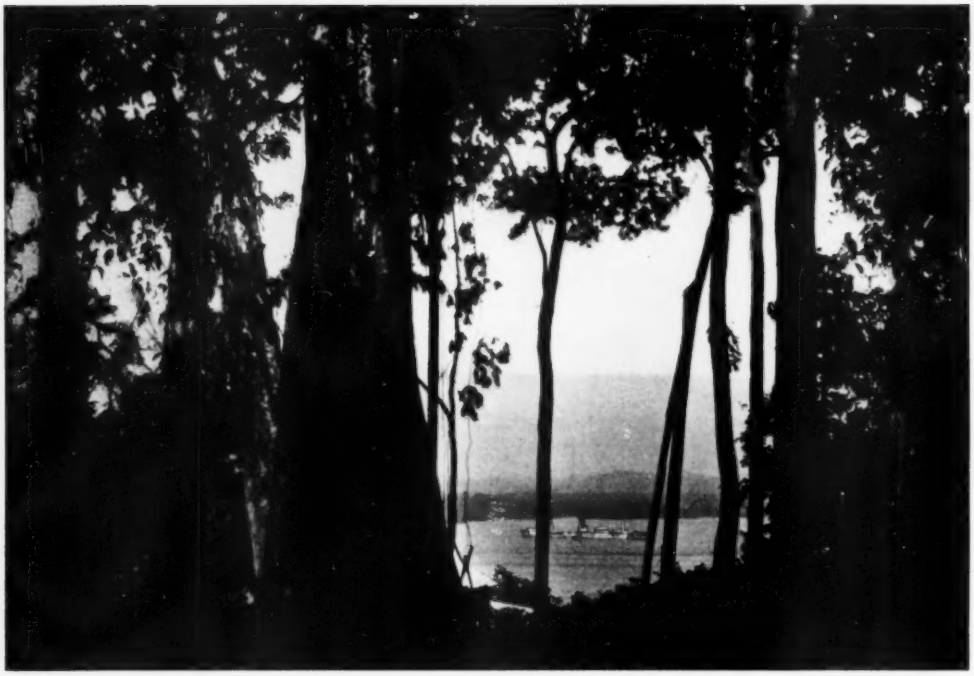
How One of the Notoriously Untamable Howling Monkeys, Caught in Its Infancy on Barro Colorado Island, Responded to the Friendliness of Its Captors

By FRANK M. CHAPMAN
Curator-in-Chief, Division of Zoology and Zoogeography, American Museum

ONE need not be a professed mammalogist to yield to the singular fascination exerted by a band of monkeys in its native haunts. When, therefore, these indigenes appear near the laboratory on Barro Colorado the botanist deserts his plants, the entomologist his insects, the ornithologist his birds, all impelled by a community of interest that expresses the validity of a zoölogical classification founded on real affinities and, in a measure, at least, demonstrates the truth of the dictum that the proper study of mankind is man.

The monkeys return the compliment. Quite obviously we arouse in them an intense curiosity. Whether this is because we are new and unusual, or whether, in spite of our bipedal, terrestrial habits, they are impressed by a relationship all too evident to us, who can say? But there is something in the howler's steady, intent, prolonged stare, in the efforts of the capuchin to obtain a nearer and a better view, in the night monkey's keen peering, and the marmoset's awareness, that warrants the belief that we are something more to them than merely large, strange creatures.

Of these four species the black howling monkey (*Alouatta palliata inconsonans*) is the most conspicuous in the forest of Barro Colorado in the Canal Zone. Indeed, a howling monkey in the tree-tops defying by voice and gesture a passing airplane, would make a fitting emblem for



GATUN LAKE AND THE CANAL FROM THE FOREST
This is the point of view from which the American Museum's habitat group of Barro Colorado was made. Here Claudia was found

the island and, at the same time, symbolize the inevitable domination of man.

I estimate that during the winter of 1928–29 about eight clans of howling monkeys inhabited Barro Colorado. They frequented only first growth or mature forest, and were, therefore, confined to an area of approximately 2000 acres. The average range of each clan is thus about 250 acres. To this territory they are apparently more or less closely restricted, for in my four winters on the island I have never known the clans to associate.

Allowing nine or ten individuals to the clan and, on the basis of the estimate here given, our present howler population is between seventy and eighty individuals. These clans, or bands, are usually composed of two adult males, and a young male or two, while the remainder are females of whom one or two may have young in arms. It is the brief history of one of these baby howlers in captivity, that I wish here to relate.

The habits of our pets, like the doings of our children, are very apt to arouse in us an enthusiastic approbation not always shared by others. But it is universally admitted that Claudia, as she was called, was possessed of a fascinating personality. If it is difficult to analyze the bases of personality in man how can one hope to do so in a baby monkey! I can only say that Claudia had large, luminous, intelligent, in fact human black eyes, and that their distance apart gave breadth if not height to her forehead. From them she regarded you with a spirit of calm, discriminating independence which was the essence of her nature and perhaps the foundation of its charm. Claudia, might with reservations be your friend, but she certainly was no one's pet. She permitted no petting and she betrayed no affection; and still I always had a feeling that Claudia had

potential affections and I knew that it was well worth an effort to win them.

It was in October, 1927, that Claudia literally fell into our hands. At this time she was probably about two months old. She was a member of the laboratory clan of howlers and, doubtless by some mishap, was left alone in a tree near my house whence she was taken by Donato. It was the 23d of the following December when first I met Claudia, and two pages of my journal of the 24th are devoted to her. From it I quote:

The baby howler is captivating. No hand-organ monkey this, but a wild, forest creature who after two months' captivity, out of the not more than four of her life, is still unapproachable. She resented the slightest touch and turned on me fiercely. For a moment I thought that she actually would attack but she vented her feelings by howling loudly. When I came from the forest at midday she was lying on her back, arms outspread, in the bottom of her cage, to all appearances dead. But she slowly opened her eyes, looked at me dully and, with apparent effort, raised one arm. I was quite sure that she was dying, and went to my house for a poncho to protect her from the burning sun. When I returned she was up, grunted a little and soon began eating. Evidently I had aroused her from a nap.

In the afternoon we removed her from the cage, which she had shared with two simpering marmosets (to whom she paid not the slightest attention), and placed her in one of her own where she would have the seclusion her reserve demanded. It is a large cage nine feet square and seven high, and in its center we set a small, well-branched tree with the leaves still attached. It was fifteen minutes before she ventured into this new field. Meanwhile, she sat on a box similar to one in her former quarters. The moment she entered the tree she began to eat its leaves, pulling them in toward her as the adults do. This important food had been omitted from her diet of bananas, rice, papaya, bread and meat. Of the latter she seemed very fond and at one o'clock today was

A BABY HOWLER

Whenever disturbed, Claudia gave vent to her feelings by howling loudly. Even after she had become thoroughly familiar with her surroundings, the sight or sound of some of her own kind caused an outcry

A SPINY CEDAR ON THE ALLISON ARMOUR TRAIL
The face of the buttressed trunk of this cedar (*Bombacopsis fendleri*) measures 31 feet, and its greatest circumference is 90 feet. The tree is about 150 feet in height

tugging at a piece held in her left hand. Changed to the right hand there was an evident lack of coördination. Mouth and meat did not connect until the left hand came to the rescue and guided the right toward the expectant point. Apparently she is left-handed. After a survey of her surroundings she made a journey of exploration of her new home, climbing from limb to limb, moving easily and freely, making some missteps but saving herself from falling by the use of her tail; an automatic mainstay. She howled loudly and repeatedly at an airplane the approach of which attracted her attention before it was visible—a valiant little baby, born old.

Claudia's actions on being placed in new surroundings proved to be wholly characteristic. She was always intensely curious, but it was curiosity controlled by caution. Nothing was too insignificant to arouse her interest and warrant investigation. Even a small stone that chanced to be dropped on the dirt floor of her cage was approached by degrees and from all sides and was eventually tested with her teeth.

She would try any food once but promptly dropped what did not appeal to her. Raisins she would always take. The seeds cracked sharply as she munched them. The skins were thrown away. If the raisin fell before she had extracted its contents, she looked down from the limb on which she was sitting until she saw it on the dirt floor, then went down and retrieved it, a perfectly coördinated bit of action.

A vessel large enough to bathe in which was placed in her cage was finally tested, like the stone, with her teeth. She made no attempt to enter it and evidently considered water as designed only to drink. In that way she used it freely but an attempt to give her a shower brought such pitiful protests that we at once desisted. Howlers evidently do not bathe. A rope, hung from the roof to the floor of her cage about two feet from the tree, met with immediate approval. Here was something

in the nature of a vine to which she needed no introduction. Her first motion was to reach for it and pull it in hand over hand as deftly as a sailor. Then she sprang for it, or, at times, went to ground, took the loose end in her hand and, walking erect, carried it to the base of the tree which she ascended taking the rope with her. Thence she swung to a perch placed on the opposite side of her cage. It was some days before she ventured to swing free to and fro on the rope.

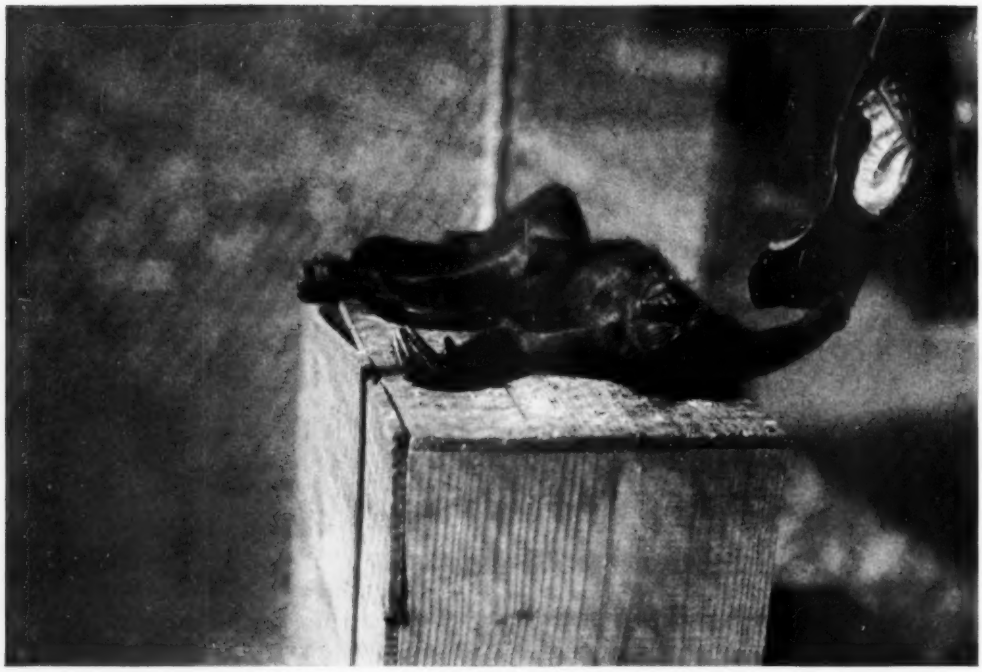
When in her tree, whether in motion or at rest, the tip of her tail was almost invariably wrapped about some conveninent branch. It functioned as automatically as her feet. When she leaped for the rope, she did not abandon her tail-hold until the rope was grasped. To test the effectiveness of this safety device, I pulled the rope aside just as she sprang for it, but in spite of the fact that to her weight was added the momentum of her spring, the tail always held. She stopped, it is true, with a jar; but she stopped.

The great event in Claudia's life during the three months I knew her was the placing in her cage of a fresh tree. To her it was a new world. Like everything else new, she viewed it with suspicion and approached it by degrees, making tentative advances from the ground and from her rope, both familiar territory. Gradually she increased her grasp on the ends of the new limbs, testing them with her teeth, and after about ten minutes she severed all caudal connection with the world behind and entered the tree. Suddenly, panic-stricken by the strangeness of her surroundings, she made a rush for safety on the sides of her cage. This was repeated time after time, minute inspection accompanying each visit until she had thoroughly explored her new kingdom and began to feel at home in it.

If Claudia seemed over cautious it

AN APPRECIATED TITBIT

When placed in a new cage which contained a well branched tree, Claudia eagerly began eating the leaves. These had not formerly been included in her diet



A MIDDAY SIESTA
To all appearances Claudia was either dead or dying when taking a nap. At noontime she often chose some spot fully exposed to the sun in which to sleep

must be remembered that she was almost wholly without experience and had no one to instruct her. In her clan she would still have been in her mother's arms and never called upon to take the initiative or reach a decision unaided. Alone she had nothing to guide her but her own good sense, courage, and instinctive prompting to be cautious, and the manner in which she accepted the numerous changes, small and great, in her new environment is a tribute to her adaptability. Unfortunately, there was no one at the laboratory during this period prepared to make a proper study of Claudia's mentality and development. To me she was only a very appealing, winning little person with whom it was always a pleasure to spend a minute or two of the time left from other occupations.

One day I placed a paroquet (*Brotogeris*) in her cage. She looked it over carefully, as she did everything, but it did not seem to impress her. Nor was she especially concerned with a coati that sniffed around the outer base of her cage. But a live, native mouse (*Oryzomys*) at once claimed her entire and eager attention. From a branch of her tree she followed its every movement as it ran quickly from side to side trying to find an exit from the floor of her cage. Frequently she uttered a sound like the gritting of teeth and to it added a high, excited squeak. It did not seem possible that so arboreal a creature as Claudia could have an inherent interest in an animal so terrestrial as a mouse. Nevertheless, it unquestionably fascinated her. So great, indeed, was her desire for a closer view of this strange, active little object, that it prompted her to descend to the ground. Barely had she reached it, when the mouse chanced to run at her and, with a convulsive leap, she sprang upon a nearby block of wood, back arched, tail tightly

curled, jaws set, eyes intent with a look which seemed to express fear, surprise, and indignation. It required only a little imagination to believe that we had here a primitive exhibition of a response which is commonly thought to be instinctive in Claudia's remote relatives of the same sex! The little excited squeaking aroused by the presence of the mouse was also always uttered by Claudia when I shook the gunny-sack which was her bed, as an invitation to play. At such times she jumped toward the sack to grasp it with teeth and hands. Possibly the mouse aroused a similar desire.

The grating sound indicated contemplation. It was sometimes continued for more than a minute. While eating, she often uttered a low, contented chuckling, and her only other conversational note was a slight grunt at times leading up to a roar. Doubtless Claudia was just as well pleased to be left largely to her own devices. When not distracted by the presence in the near-by forest of her own kin, she never seemed to lack for occupation. Her tree and swinging rope made a playground where for hours at a time she entertained herself, performing rare acrobatic feats. When tired, she often rested by straddling a horizontal limb, lying on her belly with her hind legs dangling and her chin leaning on her folded arms. From this evidently comfortable position she surveyed the world composedly and with what seemed to be a slightly amused expression.

When taking her midday siesta she sought a place, either on a box or the bottom of her cage, fully exposed to the sun, lay flat on her back and stretched her arms and legs out to the limit of their reach. I have never seen any other quadruped, and but rarely a biped, assume so

CLAUDIA SEES A MOUSE

Her first glimpse of a mouse aroused Claudia's attention to such an extent that she descended to the ground for closer observation, but when the mouse suddenly ran toward her, she sprang upon a near-by block, back arched, tail tightly curled, and jaws set

INVESTIGATION

Claudia was of a cautious nature and always carefully investigated any piece of food before taking it into her mouth. Almost invariably the tip of her tail was wrapped around some convenient branch

relaxed a pose. At night she slept in a box, with a piece of gunny-sack for a bed, usually lying on her side.

Aside from Claudia's attractive personality, I think that it was largely her evident disregard of me that led to a determination to win her friendship. Also I was influenced by the fact that howling monkeys are notoriously untamable.

I deliberately devoted myself, therefore, to the conquest of Claudia. It was slow work. She had no more time for me than I had for her. It was doubtless just as well, therefore, that I could make only brief and casual visits when I chanced to pass her home. My campaign was planned on Claudia's love of food and play, two traits on which we might meet with some hope of understanding each other. The story of how I gradually gained her confidence may best be told by extracts from my journal. It will be remembered that I first met Claudia on December 24.

DECEMBER 25. Photographed Claudia this morning. She wanted to sleep and resented being disturbed. She did not howl at me as she did yesterday, but beyond this is no more friendly. She refused to take food from my hand but picked it up from the box where I placed it. She appears to be definitely left-handed.

DECEMBER 26. Claudia took food from my hand and even ate while I held it. We are getting on. A piece of banana, a Brazil nut, a cabbage leaf, and a bit of cooked meat were all accepted, although the nut and cabbage were certainly new to her. Both the latter were soon dropped, but the meat she clung to with her left hand, eating eagerly and chewing thoroughly before swallowing. She has not yet cut all her teeth and none seems fully grown.

During the following month I made some progress with Claudia but without gaining her confidence in my good will. She soon came to recognize me as a source of unusual and palatable food, but I

myself was altogether too remarkable an object to be accepted without reservations.

Often as I entered her cage she jumped toward me from her tree to the rope and held out her hand (usually the left) for the expected gift. I tried to induce her to eat her food while I held it as a means of creating closer relations, and she frequently did so, sometimes very gently, tentatively testing my fingers; but her teeth, if small, were sharp, and I did not encourage experiments in this direction.

As a playmate I got nearer to her. Her love of play seemed quite as strong as her desire to eat. When, about half an hour before sunrise, she awoke, she went direct from her box to her swinging ropes. A second rope had been placed in her cage and she seemed never to tire of devising new methods of using them. It was with a rope, therefore, that I made my advances, and she quickly offered to bite one end while I pulled at the other. A puppy acts in much the same way. Now and again she seemed to realize that she was becoming too intimate and retreated, but each time the lure of the wagging rope won her to a new test of strength; and for a baby she was amazingly strong! Eventually she entered into this game with so much zest that even when her only hold on the tree was with the tip of her tail, shake and swing as I would, she did not relax her grip. Her tail, indeed, seemed to be quite as firmly attached to the tree as to her body. But in spite of these associations she would not permit me to touch her.

An incident that occurred on February 7 did much to advance our relations. Attracted to her cage by unusual calls, we found her so entangled in her ropes that she was completely helpless. She was terrified, and as we cut her bands she screamed like a child. When freed, she was a very much subdued monkey and

CLAUDIA EATS A RAISIN

Raisins were always acceptable to Claudia and eaten with apparent enjoyment. The skins she discarded but not until every bit of their contents had been extracted

either for this reason, or because she recognized in me a rescuer, was very gentle, eating from my hand and almost permitting me to touch her.

Five days later, or after a siege of just fifty days, Claudia capitulated. My credentials, however, were still supported by an appeal to her palate, and it was while she was eating a raisin that I was granted the heretofore unthinkable familiarity of stroking her head. The act, indeed, seemed to give her some pleasure and it had all the elements of a personal victory for me. Finally she stretched out on her gunny-sack bed, put her head on one side, closed her eyes and, with every appearance of contentment, confidence, and relaxation, went to sleep under my continued ministrations. I rejoiced in the conquest of Claudia.

After this epochal event our friendship developed rapidly, but on Claudia's lines; and Claudia's lines were play, more play, and harder play. She would desert her food at any time when I entered her cage and spring toward me. Indeed, Claudia now became the aggressor. I was, in effect, another rope and to be used as such. Meanwhile Claudia's teeth had become formidable. She never attempted to bite, but her methods of play called for their more vigorous use than my skin was prepared to withstand. I had, therefore, to cover one hand with a woolen sock, leaving much toe for chewing purposes. This seemed to please her and it protected me, while with the other hand I could maul her freely.

THE FOREST ON BARRO COLORADO
It is estimated that during the winter of 1928–29 about eight clans of howling monkeys inhabited these forests

Was Claudia now tamed? Not for a moment. I was simply one of the many strange things which she had encountered in her new environment, learned to accept and make the best of. Fundamentally she was as wild as the day of her capture. It needed only the sight or sound of her own kind to change her from an apparently happy little creature playing with her ropes, to a wild animal dashing about her cage or clinging to the wires nearest the forest and howling pitifully.

Her powers of hearing and seeing were remarkable. Often her calls first told us that howlers were

roaring in the distance or passing through the trees bordering our clearing. As time passed and she became more accustomed to confinement and familiar with us, we assumed that she would cease to respond to the 'call of the wild,' but there appeared to be no decrease in the force of her reaction to the voice or presence of other howlers.

My record for December 24 reads:

> This afternoon Claudia howled continuously for at least half-an-hour. Evidently she was startled by hearing some of her kind, but they were so far away that one had to listen intently to hear them. She jumped from limb to limb of her tree angrily shaking its branches with her hands and even biting them.

Under date of January 21 I quote:

> Claudia is wild and restless. She calls almost constantly and rushes about her cage floor, always on the forest side, as though looking for a way out. . . . She was not still for thirty consecutive seconds during the day.

As before, this activity was caused by hearing howlers call. Then would follow a period when there were no other howlers in our vicinity and Claudia seemed wholly reconciled to cage life. But with the return of the cause she would have another violent, uncontrollable attack. One could not imagine cries more expressive of hopeless despair; or a more pathetic figure than this baby monkey looking from her cage to her relatives in the tree-tops and moaning wistfully.

At this time we should have yielded to Claudia's plea and restored her to her clan. Perhaps they might have refused to accept her. But even if forced to live alone, she would have had the freedom of the forest and one must believe eventually have found a mate.

At any rate she could have suffered no worse fate than that which befell her in our care. Gradually her health failed until she could barely drag herself into the tree through which she had leaped and swung so agilely; and in October, a year from the date of her capture, she died. Her body is in a jar of alcohol in the laboratory awaiting dissection to determine the cause of her death. I have never had the courage to examine it, but whatever the autopsy may show, I believe that Claudia died of a broken heart.

A NIGHT WITH AN AFRICAN HERDER

How an Artist, Lost from the American Museum Exploring Party to Which He Belonged, Found His Way to a Native Hut not Far from the Shores of Lake Hanington, Where He Spent a Night in the Company of a Herder and His Family

By W. R. LEIGH

THE sound of two distant rifle shots reached me. I promptly answered the signal with two shots and waited; there were no replies.

The sounds had seemingly come from a point a couple of miles back and I decided that the rest of the party were following, and that I might as well sit down and wait for them.

Since seven o'clock that morning I had been traveling along the shores of that strangest of all Africa's bodies of water—Lake Hanington—and was tired. It was four-thirty, and having had no food since breakfast, I was not averse to sitting still.

Lake Hanington is a wild, inhospitable, place, rarely visited by white men. It is brackish at its southern end and briny at the north. It contains, in addition to salt, what I judged to be alkali, soda and perhaps other minerals. The surface of the water is covered with a green scum of floating algæ, and the turbid water beneath this scum exhales an effluvium that is not pleasant.

At from fifty to a hundred yards from the present shore line—out in the water—there stand many stark and lifeless trees, bleached like skeletons, that mark what looks like a former shore line. The impression was forced upon me that I was treading the margin of a basin which had been seismically lowered suddenly, for the large size of the trees indicated that a century at least of quiescence must have preceded, to permit of their development, while the bald and treeless coast of today and the entire absence of trees between it and the snags argued rapidity of action. No such trees as these exist now anywhere in the vicinity.

Beyond the blighted trees pink flamingoes formed, in places, compact armies comprising millions of individuals; their formation doubtless was due to the lake floor upon which they stood, the straight military lines indicating the depth-limit at which the birds could feed on the bottom. Novel beyond words was the spectacle of these creatures, up to their thighs in green water, and with heads submerged, casting conch-shell reflections across the shimmering surface, while those lifting their heads for air, kept up a continuous hum of conversation.

There was something weird and fantastic about this noisesome lake, set like turquoise in coral amid its red ridges—a gem of unique beauty—a poisonous talisman.

Our party had all started out together in the morning, to explore these shores of Lake Hanington, but, being impatient when the thrill of discovery lured, I had hastened ahead to see what was around the next bend, beyond the next hill—and I walk rapidly.

My gun-bearer with my canteen had lagged behind as usual—and waiting for the oaf was tedious. Besides, there was something exhilarating in being alone.

The party was a mile behind me, when I last sighted them about ten o'clock. I had paused beside a monster boiling spring to take snapshots and saw the

men coming around a bend of the shore.

I had continued along the water's edge, supposing my companions would do likewise, though the traveling became increasingly rough. There was very little soil on the red rock ridges and every form of vegetation was armed with vicious thorns, which I found impossible always to escape.

As a consequence I soon resembled a half-picked chicken. My helmet and shirt had become scarified and full of holes, while numerous scratches on my arms and one on the face were eloquent of bad going.

The sun was furnace-like, and my canteen was a regretful memory. I had expected to find drinkable water, as on the preceding day, but no such luck was in store. What looked like good water rested in rock-pockets from showers during the past night, but it proved to be a vivid imitation of lye, alkali and Epsom salts combined.

I had found numerous pools at the points where dry water courses entered the lake; the beating of waves had built up dams of sand across each trough, and behind these dams were stagnant ponds, some green, some yellow, and others blood-red—all swarming with wrigglers, skimmers, and flies; they were fetid and forbidding places.

At about two o'clock I had stretched myself in the shade of a large tree in the bottom of a deep and narrow canyon and rested for an hour.

A crow discovered me and spread the report that there was something very strange to be seen; other crows assembled, and the growing excitement attracted other kinds of birds, until there was a

A PANORAM OF SUPERLATIVE BEAUTY

"All about, in a scintillating blaze, the old-rose glory flooded. Below, it played with the lake; opalescent, quivering, and shimmering with kaleidoscopic reflections"

garrulous mob around me of a great variety of shapes, sizes, and colors; some of the smaller ones exhibited surprising inquisitiveness, coming almost within reach of my hand.

Even the lizards gathered to inspect me, and several hyrax—those curious little creatures, no bigger than a cat, whose nearest relative is the hippopotamus, sat on rock ledges and scolded mercilessly.

Up the gorge that wound crookedly, thick jungle and vine-matted gloom was noisy with the squawks of hornbills and monkeys. I debated whether it would be worth while to look for water there, but decided it would not.

Down the ravine toward the lake, the cliffs grew less precipitous and high and the walls separated more widly. Here, I decided, lay my best chance of quenching that thirst which was becoming a serious problem, and sure enough, there was a pool in the midst of a deep, sandy depression, at the foot of a dry waterfall. Half the water had evaporated out of it and a band of green scum a foot wide all a ound it was strewn with dead bugs; a defunct mouse floated in the middle of it. I didn't drink.

Making my way up out of the canyon I had pushed forward. A huge wart hog sprang up just ahead of me and glared, blinking little red eyes. With his tremendous tusks, hideous gargoyle-like head and scrawny mane, he presented a grotesque and revolting spectacle. Along the barrel of the rifle I watched quietly. He wheeled, tail rigidly erect—his danger signal—and bolted with thorn-defying recklessness.

Klipspringers and dik-dik darted out of my path and a fox glided away.

Near the southern end of Lake Hanington a peninsula extends at right angles to the shore, more than halfway across. As I approached the isthmus of this land body, I observed a herd of goats drinking from pools in hippopotamus tracks in a stretch of marsh. I was nearing the stage where I would be ready to tackle anything wet, so I approached the stately black tender of the herds.

"Jambo!" (Good day!) said I. I doubted whether he spoke any Swahili, and was delighted when he replied, "Jambo, Bwana" (Good day, sir).

"Maji hii mzuri?" (Is this good water?) I demanded.

"Hapana Bwana, mbaya sana!" (No, sir, it is very bad!)

He conducted me across the isthmus to an expanse of denuded red soil deeply furrowed by dry streams, which, where it merged into the water, became a reed-grown marsh teeming with ibis andherons; beyond this stretch, a second flock of goats was drinking.

"Maji mzuri," said my herder, pointing across with an arm heavy with brass-wire bracelets.

I put a shilling into his hand and hastened on.

Among a great number of seep-springs I found one issuing from beneath a large rock which was comparatively free from salt, alkali, and soda, and sufficiently cool to be drinkable. All the water entering the lake, I afterward learned, is hot or tepid.

The herds of goats came to dispute my water rights. They knew good water from bad as well as I did—and I had to sit on the rock and fend them off with my feet. The animals showed a thirst-born disregard for me and strove to muzzle my feet to one side. There was plenty of water, but mine was the best. I sat amid a sea of goats, while scantily clad aborigines looked on, and grinned.

A quantity of bees refused doggedly to be driven away, so they and I patched up a gentleman's agreement. Also, a rowdy rout of baboons came down from among the rocks. They, too, were water

experts—and said most uncomplimentary things to and about me.

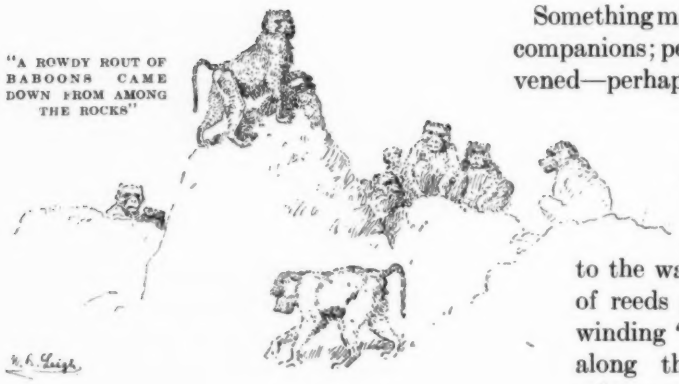
But I was adamant. I was sublimely egotistical—a glutton—deserving all their strictures, and not ashamed. I sat on my rock waiting—waiting.

Why didn't the rest of the party catch up?

The declining sun cast orange shafts that splintered and cascaded over the clump of trees behind me and sifted through chinks and crannies, seeking with gold-dust fingers to clutch me, but I escaped. I had born their malice all day; had paid the price; and now the trees were bearing the brunt of their fury. All about in a scintillating blaze the old-rose glory flooded; it rioted and romped; it steeped the escarpment across the lake in a magical glow of inimitable color—gray-green and pale amber, cerulean, chocolate and ochre cliffs, ragged, broken and crumbling. It painted salmon-pink, vermilion, and peach-blow white the eroded soil that swept down in lordly lines to the very water s edge. It splashed robin's-egg blue, lilac, mauve, gamboge, and russet patterns of dead and dying vegetation; it daubed in red-purple lava flows, startling green swipes in clefts and gashes where water occurred; black scars where grass-fires had raged; incredible royal-purple velvet shadows in canyons; and it walloped in above the tremendous supernal, ultramarine dome.

Below, it played with the lake; opalescent, quivering, and shimmering

"A HUGE WART HOG SPRANG UP"
"With his tremendous tusks, hideous gargoyle-like head and scrawny mane, he presented a grotesque and revolting spectacle"



"A ROWDY ROUT OF BABOONS CAME DOWN FROM AMONG THE ROCKS"

with kaleidoscopic reflections—a bewildering turmoil—a chaos of witching tints. It was a canvas upon which the wizard lavished and squandered enchantment.

Flapping horizontally, great white pelicans skimmed above their reflections, or joined them in a rainbow splash. With snowy bodies and black heads and wings, flocks of ibis rose, and simultaneously their images fell like showers of guava blossoms; wild geese sailed majestically like questing galleons of old, their forms silhouetted against the gleaming ivory band of alkali deposit that followed the water's edge along rock-bound shores. Bowing and tilting, each to the other, as if in playful mimicry, wading birds of divers kinds fished in the shallows above inverted counterparts, and dragon flies flashed hither and thither, chasing each other and dancing and sporting, like splatterings from the wizard's careless brush. It was a panorama of inimitable and superlative beauty.

Absorbed in contemplation of the picture before me, I sat, essaying excursions into the beckoning canyons and masses of jungle in imagination, that weary limbs shuddered at the thought of attempting—dreaming of explorations in this fairyland—fancying flights in a flying machine to those rugged summits—those far blue peaks beyond—when crash!—two reverberating boom from a distant gun recalled me to the present!

Something may have gone wrong with my companions; perhaps exhaustion had intervened—perhaps someone had gotten hurt!

I recrossed the isthmus—a long line of shore became visible To obtain a better view of it I walked across the marshy space to the water's edge, where a fringe of reeds grew. I hoped to see the winding "safari" of porters coming along the ridge, or the slender column of blue smoke and twinkle of a camp fire, but nothing of the sort appeared, only far away, a wisp of steam from a boiling spring, and the bark of a lone jackal.

Suddenly there was a loud splash! Startled, I wheeled.

An immense bull hippopotamus stood within thirty feet of me. He had been sleeping in the shallows among the reeds.

Automatically the rifle flew into position; then with the realization that the beast was as much startled as I was, down came the gun and up went the kodak—but, alas!—all the films were used up.

The bull, after a careful survey, decided I was a dubious and unneighborly interloper, and with snorts of suspicion and disgust, moved out into deep water.

I continued my retreat; impalla scurried up the hill—a hyena skulked off with ungainly motions and mean and treacherous backward scowl. In a dusty place I came upon the tracks of a leopard.

The sun, a blood-red hub amid far-flung spokes of molten gold, sprinkled ruby-dust athwart the purple ridges as it sank. It was as glorious as a sunset could be—as only African sunsets can be—an orgy of barbaric crimson—a drunken spree of red.

I reached the brink of the deep canyon where I had rested; the light was fading fast; below me a tangle of jungle obscured the rocky floor of the gorge—obscured the chaos of tumbled rocks, and—what

else? As if in answer to the thought came the raucous expostulations of startled baboons; an old male leaped from a crag to the top of a tall tree, where he sat, cursing me vehemently. He started an owl out of the tree, and some roosting birds chattered and scattered from a vine-draped mass near by. There might be a variety of marauders lurking in that obscurity, and this was the prowling hour —the time and place peculiarly appropriate as foreground to the picture, with that ocean of blood in the west.

The thought of spending the night on this savage hilltop with hyenas and leopards abroad was not appealing; to attempt crossing the canyon in darkness was not inviting either. I went through all my pockets—not a single match. Most of us have been brought up on the idea that fire frightens wild animals. I have heard it disputed by very experienced hunters, but in any case a fire is cheerful and gives warmth.

One never realizes in daylight how utterly the human is dependent on his sense of sight, but at night the truth is driven home. As the moonless night closed in, I found myself sensitive to every whisper of sound—the faint snort of a hippopotamus down in the lake, the chirping of insects, the stirring of the wind amid the trees—and I became conscious of the inadequacy of the ear for protection under such circumstances.

As I stood on the brink of the abyss, with the wind growing chilly, I heard the long weird wail of a hyena from not far distant. What was I going to do?

Seeking an answer to this question, I chanced to glance along the edge of the

"THE HERDS OF GOATS CAME TO DISPUTE MY WATER RIGHTS"
The animals showed a thirst-born disregard for me, and strove to muzzle my feet to one side

cliff, and lo—there stood an object—a—yes, a goat!

What was a lone goat doing here? Lost, evidently. I glanced about inquiringly, and discovered a man—a tall, black man—on the opposite side of the ravine, moving away. Surely, there was some connection between the man and the goat. I shouted. The man turned and started back. I told myself, as he descended into the depths, that this naked savage was going to be my host for one night.

As he climbed up the wall on my side, I saw that he was a slender man of a deep coffee color; his costume consisted of a loin-cloth, and a piece of figured calico—very dirty—over one shoulder, and depending on one side to the middle of his thighs; as adornments he wore a cord of sinew with a few shells around his neck, a bit of ostrich feather in his wool, and several brass-wire bracelets on arms and ankles. He also wore sandals.

I waited and said, "Jambo?"

He answered "Jambo!" with a different intonation. (Well, thank you!)

It was up to me to marshal all the Swahili at my command.

"Wapi nyumba ninyi?" I asked. (Where is your house?)

He repeated the word "nyumba"; evidently he did not know as much Swahili as I did. I changed my question.

"Wapi boma ninyi?" (Where is your hut?)

"Boma—boma?" he puzzled.

"Wapi shamba ako?" (Where is your patch?)

He looked at me blankly, as well he might, since gardens were unknown here.

I was becoming desperate.

"Wapi lala wewe?" I ventured. (Where do you sleep?)

Ah!—his face brightened—he understood. He pointed across the gorge toward the top of the ridge.

Encouraged by this success I propounded another pertinent question:

"Sikia bunduki wewe leo?" (Have you heard a gun-shot today?)

Again he was mystified.

"Hii bunduki!" I said, shaking the gun under his eyes.

"Vema!" (Yes!)

He pointed across the gulch once more; this time toward the lake shore.

So I was right. The party could not be very far away—camped down on the lake somewhere, probably.

Now I had an urgent question to ask.

"Wapi maji mezuri?" (Where is good water?)

He pointed down into the black depths.

But now he, too, had a question to ask.

"Tazama mbuzi moja wewe?" (Have you seen a goat?)

I led him to the spot where I had seen the goat, and lo! the beast had vanished.

"Chakula kwa fisi!" (Food for the hyenas!) remarked my friend, as he glanced about him in the thorn thicket and fast-growing darkness.

As the case of the goat was evidently hopeless, I renewed my suggestion that we proceed to where the water was; he led the way to the top of the hill. The ground rose steeply to the highest part of the ridge through which the water had carved the trough, and where the pit was deepest. I looked down into blackness where tree-snags and rock-splinters were sticking up, and bats flying about. Something that sounded like a frog sent up a wavering squawk from the inky obscurity and the old baboon uttered imprecations again—it seemed like looking into hell and disturbing the fiends!

The trail down which that aborigine took me was both engrossing and hair-raising. He was very careful to draw attention to shaky stones, and deep drops, and somehow we reached the bottom alive and even unhurt. It was a wonderful spot. I wish I could have seen it by daylight—with huge trees, great bowlders, and a fine pool amid rocks and

roots. I went for that maji mezuri—it was cool and pure—a priceless treasure in this land of heat and bad water. Eerie and creepy was the gloom, and mysterious the amorphous forms that shut us in. A pendent creeper brushed my ear—a frog dived into the water with a startling splash—the drops of water struck my arm.

How helpless we would have been against the leap of a leopard—and what more likely place to encounter one?

The ascent out of the canyon was more gradual. On the level once more, my guide led with swinging strides for a mile and a half.

I kept a sharp lookout for the camp fire I expected to see, down toward the lake, but none appeared.

We reached a goat corral where two little boys awaited their father. Some conversation, of which I understand not a syllable, ensued. It evidently concerned the camp I was looking for, and I divined it was adverse to my hopes.

THE HERDER
"I told myself that this naked savage was going to be my host for one night"

I asked the older of the boys in Swahili the same question concerning the gun-shot and he replied affirmatively, but waved his hand in the opposite direction. I wondered whether he had understood me correctly.

"Wapi usiku lala wewe?" (Where will you sleep tonight?) asked the man, turning to me.

"Mimi lala hapa," (I will sleep here.) I answered.

He led the way up the ridge to a second corral, beside which stood a lone tree. It was high above the lake on the crest of the ridge—a bleak and barren spot, all rock and scattered lava-stones, with a sparse and miserable sprinkling of stunted thorn bushes.

A hut occupied the center of the circular corral. It was so placed that when the buck goats got to fighting, the vanquished ones would have something to run around and escape being killed. This was no idle precaution.

The wife came out with a baby in her arms, followed by a mongrel dog. My hostess was solicitous—I was a stranger in distress—she must be kind, look after my needs. She was a gentle and motherly soul, with a soft and melodious voice.

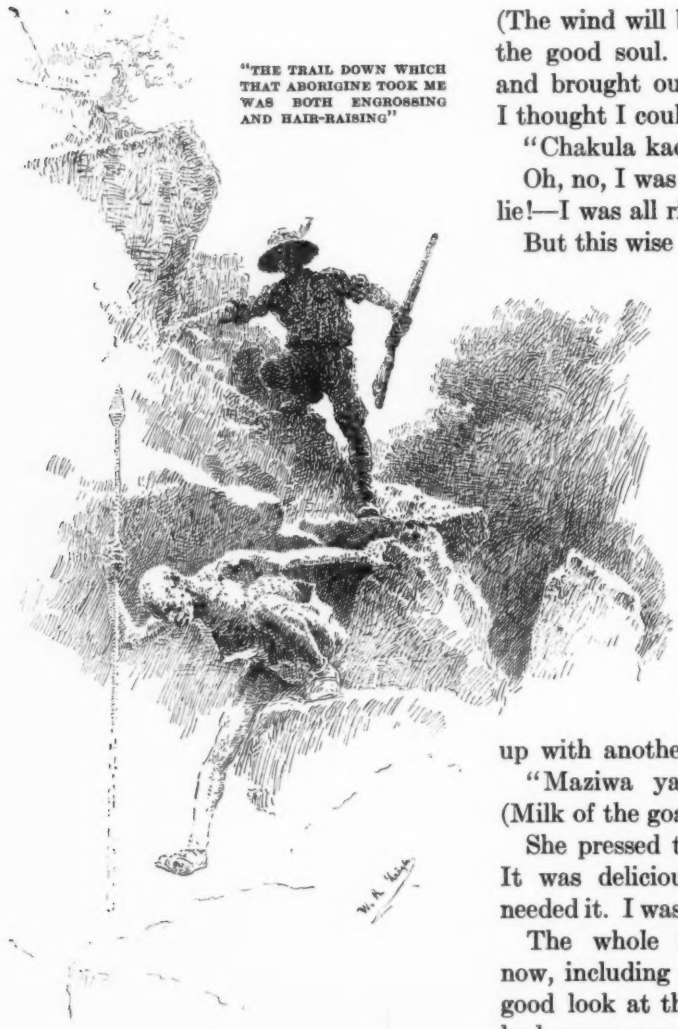
"Mwanamke," said I. "Sikia bunduki lwo hivi wewe?" (Madam, have you heard a gun today?)

"Ndio!" (Yes!) She spoke more Swahili than her lord. She waved in the same direction as the boy had previously.

'Zamani sana—bili—mbali sana!" (Long ago—two—very far!)

I was amazed. Evidently I had been deceived by the conformation of the hills and had come five miles back in the wrong direction.

Madam's costume consisted of a sort of skirt of leather from the waist to the



"THE TRAIL DOWN WHICH THAT ABORIGINE TOOK ME WAS BOTH ENGROSSING AND HAIR-RAISING"

knees, some brass rings around the ankles, a few wire bracelets, and wooden disk-plugs in her ears. The children were quite naked.

"'Lala naani kibanaa wewe?" (Will you sleep in the hut?) asked my hostess, politely.

No, I would sleep under the tree.

Would I have a blanket?

I thanked her kindly—no, I would not trouble her.

Visions of vermin loomed large—and in this country devoid of adequate disinfectants—ye gods!

"Opepo myngi biridi sana Usiki!" (The wind will be cold tonight!) objected the good soul. She went into the hut and brought out two hairless goatskins. I thought I could risk these.

"Chakula kadogo?" (A little food?)

Oh, no, I was not hungry—a thumping lie!—I was all right.

But this wise woman knew it was a lie. She brought from the shamba a gourd full of sour milk.

"Maziwa ya ngombe—mezuri sana!" (Milk of the cow—very good!)

More visions, this time of typhoid, but—it was up to me to drink some of that milk. It wouldn't do to offend my kind hostess. I drank. Typhoid or no typhoid, it was good.

Then the boys came up with another gourd.

"Maziwa ya mbuzi—mezuri sana!" (Milk of the goat—delicious!)

She pressed the gourd into my hands. It was delicious as she said. Also, I needed it. I was rather weak from hunger.

The whole family gathered around now, including the dog, to have a really good look at the strange new being who had come among them. I was a nine day's wonder—a small circus.

The lustrous full moon rose over the escarpment, across the lake, its reflection sparkling and shimmering athwart the water, while flying flamingoes sped across the golden path like wraiths, and the head of a swimming hippopotamus—a black moving dot, leaving ripples behind—cut obliquely toward the shore.

The first object of absorbing interest was my gun. I showed them how it worked. They took it in their hands, and I directed them how to place it against the shoulder and sight along the barrel.

But I was careful to keep the safety device locked.

Next my eyeglasses had to be inspected and tried on by each in turn. They evidently thought it would give them magical powers of sight.

My fountain pen was a wonder, and when I got out a notebook and drew animals on a leaf, they clustered about closely to watch the miracle. The moonlight enabled me to see what I was doing.

But my watch was the most absorbing marvel of the evening. It was mysterious and charming beyond words. Everybody had to listen to it tick, and when I tried to explain what its use was, I got all balled up in my Swahili, and what weird notions they imbibed heaven knows.

The buttons on my clothes were fascinating objects, also the buckle on my belt, and the stuff of which my clothes were made. My helmet had to be tried on by every one except the baby and the dog.

My kodak was so awe-inspiring that no one would touch it—luckily—and my shoes with the hobnails in the soles were bewitching.

The freckles on my arms and neck were infinitely interesting to the boys, and the baby wanted to take hold of my moustache; even the dog found me most interesting to smell. I was on the verge of becoming conceited.

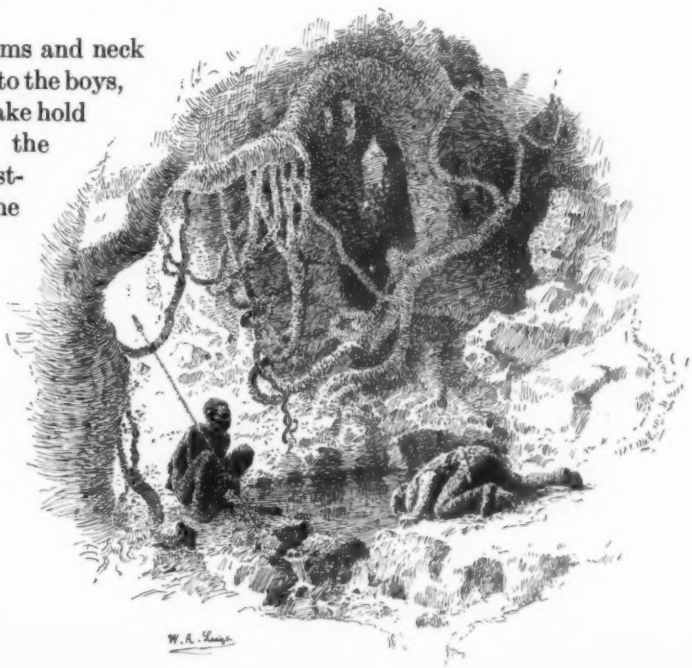
Small animals very much resembling Arizona skunks came searching in every crack and crevice—evidently for beetles—and absolutely disregarding our presence, foraged between our very feet. No attention was paid to them. Even the dog ignored their presence with odd indifference.

I began to grow weary and adjusting the goatskins as best I could to protect me against the sharp wind, which by this time was blowing, I made myself as comfortable as possible amid the stones; the family retired to the hut, but the man brought his blanket out and slept under the tree to keep me company.

I was not conscious of sleeping any that night; the stones were the trickiest and most malicious I ever encountered. No matter how I shifted and squirmed, they got me. They were really diabolical.

Somehow—I never have figured out just how—the moon got from one side of the sky over to the other side. I know, because I had to keep my back to it to keep it from shining in my face, and there came a time when I had to turn over.

My host slept with the calm serenity of an infant—stones, moonshine, and all. Several times I raised my head and looked at him enviously. Even the goats



"HOW HELPLESS WE WOULD HAVE BEEN AGAINST THE LEAP OF A LEOPARD"

ceased their bleating and went to sleep some time after I closed my eyes. At last everything slept but me, and the near-skunks, and a lone hyena far away.

I looked at my watch—it was four o'clock. I became shivering cold; my teeth almost chattered.

The man evidently felt it too. He got up and gathering a few sticks, lit a fire. I didn't see where he got the coals from, but they must have had a little fire back in the hut. The boys came out with him when he brought the coals, and the four of us hugged the little blaze. Then the dog came out. He was not entirely out of his puppyhood, and wanted to play with somebody's fist or foot all the time.

The boys snuggled up to their father, and he told them little snatches of story about the stars, of which I understood nothing.

The moon had gone down in the west, and now a wan luminosity began to grow in the east. Some water bird down the lake began to call. In the east a comet went down the sky.

"MY WATCH WAS THE ABSORBING MARVEL OF THE EVENING, AND EVERYBODY HAD TO LISTEN TO IT TICK"

"Nakuja karibu marra kwa marra chui kwa mbuzi?" (Do leopards ever come after your goats?) I asked my host.

"Pana-siku," (Sometimes,) he said. Hyenas also came, he stated, and told me things doubtless deeply interesting had I understood what he was saying.

Soon objects began to become more distinct. A ghostly wisp of mist lay along the shore of the lake. It was the steam from a boiling spring.

A little fragment of cloud directly above the sun suddenly became a gleaming dab of gold on a rose-purple background; an infinitely delicate and elusive panorama emerged gradually from the obscurity of night. The stars paled.

Below us on a dead tree a dozen vultures sat like wooden dummies; without warning one made a lunge at his neighbor, wings loosened, spread, and one bird flapped off heavily to another tree.

My hostess emerged from the hut. I said "Jambo" and put a shilling in her hand.

"Kwa heri!" (Good-bye!) I said.

We shook hands cordially.

"Kwa heri bwana!"

I picked up my gun and camera.

"Kiongozi!" (Guide me!) I said to the man.

He picked up his spear.

But I was not to get off so easily. The boys discovered my hunting knife in its lionskin sheath; they must examine so wonderful an object. They asked their father what kind of skin the sheath was made of—he was undecided—there are no lions in that vicinity.

"Simba," (Lion) I told them.

They were enormously impressed, assuming, of course, that I had killed the lion, which I hadn't.

The baby cried, and Madam re-entered the shamba and immediately returned with the baby taking his breakfast.

I gave the boys some pennies, and the man and I "hit the trail" just as the first dazzling bit of the sun's rim climbed above the horizon.

My guide was expert at avoiding thorns. It interested me because I had not been so successful; the lack of clothing was one thing in his favor, and experience become instinct did the rest. The natives adhere fairly consistently to trails. The goats and game make a great many of these, but my trouble was that I got tired out dodging under bushes which the animals could pass under easily.

My native showed me the trail, which had branched off at the big boiling spring from the lake shore, and climbing the ridge halfway, had passed around the canyon and me; in the dust were the impressions of the automobile-tire sandals of my tent-boy, so all question was eliminated.

An hour and a half of trudging over rocks brought us in sight of a small river entering the lake, above whose strip of forest rose the welcome blue smoke of the cook's camp fire.

From a painting by Louis Agassiz Fuertes

FALCONING

By GEORGE G. GOODWIN

Assistant Curator, Mammals of the World, American Museum

How Hawks Are Trained for One of the Oldest Sports. Tercels and Eyesses, Haggard and Passage Falcons, Branchers and Others

HAWKING is one of the pastimes of olden days that everywhere has retreated before the advance of modern hunting inventions. It is not astonishing, therefore, that the average English-speaking person of today has only a vague idea of the meaning of falconry, its antiquity and medieval splendor. There are still a few followers of this sport, however, both in England and in America, and occasionally a falconer may be found with his falcons and tercels, his lures, and his hoods.

The art of training and flying hawks as a means of securing game flourished in the age of chivalry five or six hundred years ago, when one of the distinguishing marks of a man's rank and birth was the hawk upon his wrist. It was the sport of kings when the wild boar was hunted in Eskdale, and the wolf and polecat were still to be found in the Sytchly country, and when the heron and the bittern were at home in the meadows and marshes around castle moat and abbey wall.

A picturesque language tinctured with jargon has long since become inseparably attached to falconry. The falconer has a name for every part of the trappings and gear he uses. He also has a name for each of his hawks. A glance at some of the records of old hawking clubs reveals some very striking and romantic names, such as "Comet," "Destiny," "Lady Jane Grey," "Empress"; for the male falcons or tercels the names "Druid," "Butcher-boy," "Vanquisher"; Goshawks were given names such as "Gaiety Gal," "Enid," and "Shadow O' Death."

In medieval times hawks were allotted according to rank. None but kings and members of the royal family were allowed to fly gyrfalcons. The peregrine falcon was legally assigned to prince, duke, and earl; the sparrow hawk to the priest; and the holy-water clerk had to put up with the musket.

Falcons at various ages are so surprisingly different in performance and character that the falconer has a separate name for each age. A young falcon taken from the nest is an "eyess." When the

young hawk has left the nest, even though it is still in the neighborhood of its infancy, it is a "brancher." Those taken during the autumn migration are called "passage falcons," and adult wild hawks that have had two or three years of liberty are called "haggard falcons." The name "falcon" is usually applied to the female, while the smaller male is called the "tercel" or "tercel gentle."

The eyesses, or young hawks, taken from the nest, though much easier to handle and train than the haggard, lack the dash and style of the old, wild caught birds. To overcome this drawback, the falconer puts his young hawks out to hack—that is they are put in an open basket on a roof or on the stump of a large dead tree, fed with fresh meat, and left entirely alone. The wilder they get, the better hawks they make when trained. Young hawks, if properly handled, will learn to fly and stoop in a remarkably short time, making long flights into the neighboring country, but returning at regular intervals to be fed. For three full weeks the young hawks have absolute freedom, but as soon as they begin to kill for themselves, which usually occurs during the third week in the case of the tercels, they must be taken in. The falcons, being larger birds, take longer to mature, and may be left out for a greater period of time.

The process of training has been discussed by numerous writers in many books and in many languages. The procedure varies. The Hollander catches his hawks when in passage or migration, while the Scotchman takes his from the nest.

CHARLES W. R. KNIGHT WITH HIS TRAINED GOLDEN EAGLE

The golden eagle is used mostly for game such as hares and foxes, but as it is large and clumsy and goes directly at the quarry, its flight is not so spectacular as that of the falcon. In Asia the natives still use the golden eagle for supplying their larder with game

The object, however, in either case is the same, that is to teach the hawk to be obedient.

The real training of the hawk, or manning, as it is technically termed, starts when the eyess is taken in from hack or at the time of the migrant's capture. First a soft leather hood is put over the hawk's eyes, and a pair of jesses (short strips of leather) are fastened around its legs just above the foot. The jesses are then joined together on a swivel which, in turn, is attached to a leash and tied to a block.

To keep the falconer in constant touch with his bird, a bell is fastened on each foot just above the jesses. He knows exactly what it is doing from the sound of the bells, and in the case of a lost hawk these are of infinite value. As the hawk moves, the tinkle of a good bell can be heard distinctly for more than a quarter of a mile. The best bells are now made in India, but European bells, though of a different shape, answer the purpose very well.

The hawk, equipped with all the necessary trappings, is now ready for the delicate business of training. It is carried on a gloved hand for several hours each day, gently stroked, and spoken to. The feeding is first done through the hood; later, the hood is removed by candlelight while the hawk is feeding, and is replaced before the end of the meal. In this way the hawk does not associate the hood with the end of its meal and thus resent it. When the hawk has become used to people by artificial light, it is fed unhooded in day-

A PEREGRIN FALCON
(Passage Falcon)

This particular individual, captured by the sailors on a liner at sea, 200 miles up the coast of Nova Scotia, later came into the possession of Mr. Goodwin, who trained and used the bird during the hawking season, and then gave it back its freedom. Falcons, under normal conditions, perch on rocks, and therefore the falconer provides a rock or a wooden block for them to rest upon

EUROPEAN GOSHAWK

This powerful short-winged goshawk catches its prey in a short, quick flight. It is naturally a forest-living bird, perching on the limbs of trees, so when in training, it must be provided with a bow perch

light, but the hood is always replaced toward the end of the meal.

If it is a falcon that is being trained, the lure is next brought into use. This is the most important factor in the falconer's equipment. It consists of a padded flat weight covered with leather, with the wings of a pigeon attached to either side. It is also provided with strings for the attachment of food, and a long string by which to swing it. The weight, however, is discarded when the hawk has been trained, for by then the hawk has been taught not to follow its natural instinct to carry its victim away. The feeding is now transferred from the glove to the lure, and after a few lessons the falcon goes immediately to the lure for food. The distance it has to fly is increased day by day, first with a line attached to the jesses, then without. When the hawk will come two hundred yards, the lure is jerked out of sight just as the hawk reaches it. If all goes well, the hawk then mounts in the air and wings round for a second attempt at the meat on the lure. This time it is rewarded. After a few repetitions of this, the hawk is kept on the wing, or "waiting," as it is called, for several minutes. This exercise is increased daily.

The hawk is now ready to be "entered." An easy bird of the particular quarry that the hawk is to pursue, is put out in a small clump of bushes in an open field and sprung when the hawk is overhead. If a crow is used, the falconer places a freshly killed pigeon under the black wing before the hawk has a chance to taste the unpalatable flesh of the crow.

The error is often made of entering the hawk to a pigeon thrown out of the hand.

AMERICAN GOSHAWK
(Haggard)

Mr. George Goodwin obtained this bird from the New York State Game Farm where it had been caught in a trap. It is probably the first of its species to be trained for falconry

READY FOR A MORNING'S SPORT
Mr. Goodwin inherited his interest in falconry from his father, Mr. W. J. Goodwin, who was a devoted follower of this sport, and is here shown with his hawk and lure in the Shropshire Hills, England

An eyess hawk will faithfully follow the game that it is entered to, and there is no surer way of losing a hawk than by having it check off after some stray pigeon half a mile away. Throwing the pigeon out of the hand also gives the "show" away, and the hawk will always expect a repetition.

The manning of a haggard or "passage falcon" is in some respects similar to that of the eyess, which has been but briefly described, but it would be impossible even to begin to explain here the skill, patience, and understanding that are required by the falconer before he can redeem a wild caught falcon from a state of fierce hatred and suspicion and subdue it into complete trusting submission.

There are four principal hawks used in Great Britain today. They are the long-winged hawks: the peregrine falcon, and the merlin; and the short-winged hawks: the goshawk and the sparrow hawk. The short-winged hawks are flown straight from the fist at the quarry. The flight is short, quick, and close to the ground, whereas the long-winged hawks usually kill up in the air and trust more to speed.

I have trained and flown successfully, in America, duck hawks, American goshawks, Cooper's hawks, and sharp-shinned hawks. The little pigeon hawk, an equivalent to the European merlin, would train to perfection, but so far neither old nor young has been obtainable. The American sparrow hawk is for all practical purposes too small to be useful. It is very different from the European sparrow hawk, which is a short-winged hawk similar to a sharp-shinned hawk, but larger.

In Great Britain, hawking, like hunting and fishing, has its proper seasons. In the early spring the long-winged hawks are flown at rooks, crows, and magpies. By the twelfth of August, these same hawks are through the molt and ready for the Scotch moors, where the falconer witnesses the unforgetable sight of his hawk stooping downward from a great height at a fast-flying grouse and knocking it headlong into the heather. In September

these hawks will make equally short work of the partridge.

In the *Badmington Library*, Lascells gives the following excellent description of the famous flight of "Bois le Duc," a haggard falcon, at a rook.

We take up our position behind a stack to wait for a rook passing on his way from the rookery in the valley to the sheep-fold on the hill. Presently we see one coming, toiling slowly over the shoulder of the down.

Shall we fly one of the young falcons lately entered and coming on so well or shall it be the old heroine of a hundred flights, victress over more than double that number of rooks, that flies now her fourth season with all the vigor and dash she displayed in the blinding snowstorm and heavy gales of her first year? A hundred or two yards is far enough for a slip with a young hawk, but with a real good one a quarter of a mile is not too far, while many and many a time, if the wind be right for her the old hawk has been slipped at rooks a fair half mile away.

It looks as if this slip would be too far for a young hawk, so the handsome old falcon is taken on hand to the delight of the whole field, not one of whom, however, large as it may be, but will stay on just one half hour more when it is announced that it is the turn of old "Bois le Duc" to fly at the next chance that occurs.

All is hushed as the rook, a single bird, presumably a strong old cock, comes slowly up. He passes us and is going nicely on when something about the party awakens his suspicion and he gives a sudden swerve that in one second takes him about 150 yards off on a side wind.

We are not to be done this way, though, and in a moment the head of our party, with falcon on hand, dashes out at a brisk gallop down wind of the rook which hastens up on wind. But a hundred yards or so is no matter to us with this hawk, and the moment we are fairly down wind of him the hawk is unhooded and flung off; and the falcon is in hot pursuit of her quarry, rising with each stroke of her powerful wings till she seems to shoot upward like an arrow from the bow.

The rook has seen her, and is making his way upward at no mean rate; but the pace of the falcon is too much for him, and ere long she is above him. Poising herself a moment, she comes with one terrible perpendicular stoop straight at him.

It would seem as though nothing could escape, but our rook is equal to the occasion, and with a clever shift he has dodged her attack by a good yard or more.

Well done, rook! but there is clearly now no safety for him in the air, for the falcon has shot up again, with the impetus of her swoop, to a height scarcely inferior to that from which she

AMERICAN PEREGRIN FALCON
(Eyess)
Hooded and waiting to step on to the falconer's hand

PEREGRIN FALCON
(Tercel)

Hooding the falcon requires great skill and gentleness to avoid alarming the bird and making it hood shy. Mr. W. J. Goodwin has just removed the hood from his favorite tercel, before releasing the bird

descended; so turning his tail to the wind, he makes all possible haste to a small patch of thorns that promises a temporary shelter, having, however, on the way to evade two similar stoops from the hawk, almost as fine as the first.

Alas for friend rook! On reaching the covert he finds it already occupied by the enemy, in the shape of the excited field who soon drive him with halloo and crack of whip from his shelter, and compel him again to seek the open. The falcon has, however, strayed a little away; so he starts with might and main to ring, in spiral curves, into the very clouds.

After him starts the hawk, but soon finds that a really good rook, such as this one is, can mount nearly as fast as she can.

Up, up they go, gradually becoming smaller and smaller. Ring above ring does the falcon make, yet without getting above him, till, apparently determined to gain victory, she starts off into the wind to make one tremendous circle that shall attain her object.

Steadily into the wind she goes, the rook striving to follow her example, and appearing from below to be flying after the hawk. At length, as she almost completes the outer circumference of her circle, the rook perhaps feeling his powers exhausted, turns down wind, and, at a great height makes off as fast as he can go.

Surely the flight is over, for the falcon is still working away, head to the wind, as hard as she can—in fact, the two birds are flying in opposite directions, half a mile apart. "Not a bit of it," say the initiated, who are off down wind as fast as they can ride.

In another moment you see the falcon come round, and though at such a height she looks no bigger than a swallow, you can see that she is far above the rook, while her pace, slightly descending as she is, is almost that of a bullet. So thinks her quarry, apparently; for shutting his wings, he tries to drop like a stone into a clump of trees now nearly beneath him.

Swiftly as he drops, there is a swifter behind him, and down from that terrific height comes the falcon like a thunderbolt. Lord, what a stoop!

By the powers she has missed! and surely he must escape.

But no, shooting upward like a rocket, the old falcon put in one more straight, swift stoop, and the rook is taken just as he enters the sanctuary which he has had his eyes on from the first. Whoo—who-op! A grand ring! A magnificent stoop! A splendid flight! Bravo! 'Bois le Duc'."

It is only in modern times that the crafty rook has been pressed into the list of available quarry. Both rooks and

crows, though common, are possessed of considerable powers of flight in time of need, and can shift from the stoops of some of the fastest hawks with considerable ease.

During recent times the writer has noticed a marked interest shown in falconry by American sportsmen. Through the invitation of Mr. E. T. Tefft, falcons and goshawks were imported from England and flown during the springer spaniel field trails at Brewster, New York, in 1926. These same hawks were again flown at Fisher's Island the same year, and I also flew American falcons at this meet. In 1927, Mr Tefft had four or five duck hawks and Cooper's hawks trained at Brewster.

Falconry is a noble, picturesque pastime in itself, and has many attributes that make it an interesting and pleasure-giving sport. Its possibilities are unbounded here in America, where hawks can easily be procured, and where the ample, open spaces of the plains afford an excellent opportunity to carry on the sport.

NEST AND YOUNG OF THE RED-SHOULDER HAWK

A peculiar habit practiced by many hawks is the decorating of the nest with evergreen branches. The significance of this habit has never been determined so far as Mr. Goodwin knows. Near the egg may be seen the body of a Brewer's mole

THE BLACK ART

An ancient and elaborate fiction which man has invented to give himself a sense of power of circumstances

By MARGERY L. LOEB
Department of Anthropology, American Museum

A FEW years ago an alert social worker in Little Italy found to her amazement that the tenements of Mulberry Street housed numerous sorceresses who carried on a prosperous business in charms and incantations, and that in hall bedrooms people were piercing effigies with darning needles and scorching them over the gas flame, to destroy their rivals in love or other persons against whom they bore a grudge.

More recently a farmer of York, Pennsylvania, was killed by two boys whose crops and cattle had been blighted and whose families had sickened. It was claimed that the victim was a witch doctor, or "hexer" as the Pennsylvania Dutch dialect has it, and that he had been bringing misfortune on the whole neighborhood by his sorcery. The trial revealed that an elaborate traffic in witchcraft was firmly established in the midst of what is in many ways one of the most progressive farm communities of the country, among people who tune their radios to station WJZ or WEAF, New York.

Such incidents seem fantastic anachronisms, and yet we find the vestiges of magical practices persisting even in the commercial centers of our big cities. When hard-headed business men in the silk industry feel that they must discard a textile design based on peacock feathers because of the superstitions associated with this bird, and when skyscrapers, the symbol par excellence of the Twentieth Century, commonly omit the number thirteen from their floors and rooms, it seems evident that even in this rational and materialistic day and age the deep-rooted belief in the potency of certain talismen to divert the forces of destiny still has a foothold.

The belief in magic is probably as ancient and as widespread as is the concept of a supra-mundane force or forces which control the fortunes of human beings and the every-day occurrences of the earth and account for the unreliable vicissitudes of luck and all the inexplicable experiences which must have puzzled man from the beginning. In the face of his utter helplessness at the hands of these whimsical and indomitable powers, man, in order to keep up his courage, has always had to imagine that there were means by which he could exert some influence over them. At times he has chosen to sway them by the same methods he has successfully used in influencing his fellows—by cajolery, flattery, bribery, or supplication. On the other hand, he has also believed that he could under some circumstances actually exert compulsion over destiny. To this end he has invented the technique of magic, by which he has conceived that the "powers that be" could be compelled to bring about his desired ends, whether of revenge, love, fertility, or health.

Man has imagined that, often guarded by an intricate and delicately set approach of rituals and incantations, there must be triggers, so to speak, which, when once touched off—whether willfully or by accident—would automatically divert the forces of destiny into particular channels. A given result would follow from the release of a specific trigger in a sequence

of cause and effect, as an electric bulb will glow if the button by which it is controlled is pressed.

The magnetic force which man believed could so effectively divert the supramundane powers, operated by virtue of a sympathy—a magnetic circuit as it were—which existed between events, and certain actions, objects, sounds, or words, which bore one of two relationships to each other. The first of the relationships was that of similarity. There was a potential force—a charged channel, through which, when opened, the powers of destiny would be drawn—between things which looked or sounded or felt alike. Thus, when the image of a person was mutilated under the particular circumstances which released the trigger and rendered the channel active, events would inevitably so shape themselves that the person himself would receive a similar mutilation.

The second relationship was that of contiguity. There was the same kind of a bond between things that had once been associated with each other. Thus, since the number thirteen had once been associated with the catastrophe of the Last Supper, anything to which it was subsequently applied would also attract to itself a doom of misfortune. Often the origins of charms and incantations are obscure or lost. Probably always the reasoning behind the procedure is as unconscious as are the rules of grammar to a person speaking a language. But when objectively viewed, the same principles are found at the core of magical practices the world over.

He who has knowledge of how to arrive at and set off the triggers—who knows the formulæ of incantations and rituals—is master of the power latent in the elaborate switchboard. Sometimes the means of energizing the channel are

Courtesy of the Museum of the American Indian

A MEDICINE LODGE CEREMONY
A witch doctor of the Black Coyote tribe performing a mystic rite for the benefit of his companions in Southern Cheyenne, Oklahoma

From "The Arunta," by Spencer-Gillan *Courtesy of Macmillan*

AUSTRALIAN ARUNTA PREPARING FOR THE WITCHETTY GRUB CEREMONY

The members of the clan are decorated to imitate the appearance of the grub. The participants sit in a long narrow structure which represents the chrysalis, and sing about the grub in its various stages of development. Then they shuffle out, squatting on their haunches, and sing of the insect emerging from the chrysalis. The natives believe that this performance will multiply the actual number of grubs

simple and direct, such as the mere application of the number thirteen to an object. At other times, although more complex, they are at least common knowledge. The mass of magical lore which most commonly finds its way into literature is that which is generally known to the people at large in any given community. But often, and particularly when matters of importance are at stake, the procedure is intricate. The triggers are deep-hidden in the folds of esoteric lore and only the professional sorcerers—the witch doctors, medicine men, shamans, or whatever they may variously be called in various places, know how to reach them. As a result, especially among certain primitive people to whom the belief in witchcraft is a dominating factor of life, the professional sorcerer is probably the most important and powerful person in the community, as well as the most highly respected authority on all matters.

There is probably no people among whom some phase of the magical complex may not be found, yet the forms which it takes differ widely in different places. It is often associated with the most matter-of-fact economic pursuits, so that however skillful a hunter or builder may be, his main concern, among many peoples, is with the magic he employs to bring about his results, and he attributes his success rather to his knowledge of charms than to his skill in hunting or building. Again it may relate to the most esoteric religious practices, as among the Todas of Ceylon, whose religion is centered on the tending of the sacred cow herds, and whose priests are constantly busied with the magical means of caring for the dairy temples. It is often involved with related

complexes, as for instance in Africa where divination and trial by ordeal are important functions of the witch-doctors. Its techniques vary from the hysterical states in which alone the Eskimo and Siberian shamans can make themselves effective, to the simple and direct charms for curing specific ills, which are passed over the garden fence in country villages.

And yet in spite of these multitudinous variations, the minute similarity in the details of magical practices in widely separated parts of the world is striking. A particularly good illustration lies in certain formulæ used to insure the growth of strong second teeth after the first teeth have fallen out. Thus, among the German peasants, a child will throw a cast tooth into a mouse's hole, saying at the same time "Mouse, mouse, give me your iron tooth; I will give you my bone one." Similar formulæ are followed for the Jewish children in Southern Russia, the children at Raratonga in the Pacific, on the Kei Islands southwest of New Guinea, and in Mexico. Among the Singhalese, it is to the squirrel that the tooth must go. The Cherokee Indian child addresses the beaver, and the Macedonian child throws his tooth on the roof for the crow.

Perhaps the most commonly known and the most widespread magical practice is that of working the desired end on an image or effigy, in order to bring about a similar result on the person himself. This is the clearest illustration of the principle of similarity or imitation—that between like and like there is a potential power. No catalog of the places in which it is found could come near being complete. It was known in ancient Egypt, Babylon, India, Greece, and Rome, and is practiced today in the Italian community in New York, among the Pennsylvania Dutch, among many European peasants, and by primitive peoples from sea to sea. It frequently explains the difficulty explorers have in photographing natives, for many savages feel that with so exact an image in his possession, the

From "The Arunta," by Spencer-Gillan *Courtesy of Macmillan*

DRESSED FOR THE CEREMONY

This Australian Arunta, decorated with down and paint, is ready to take part in one of the imitative ceremonies for increasing the food supply

American Museum photograph

A PUEBLO DANCE TO BRING RAIN

The kachina dances of the arid Southwest are almost all directed toward the bringing of the rain so necessary for the corn crop. A feature of some of the dances is to throw sacred corn meal into the air, letting it scatter and drop in imitation of the rain

white man's power over their persons would be unlimited.

The Peruvian Indians, to kill an enemy, moulded an image of fat mixed with grain, and then burned the effigy on the road where the victim was to pass. They drew a fine distinction between the puppets made to kill a white man and those made to kill an Indian. For an Indian they used maize and the fat of a llama, but for Spaniards, who did not eat llamas and who disliked maize, the image was made of wheat and the fat of a pig. The aborigines of Victoria, Australia, drew on the ground rude likenesses of their enemies, and condemned them to de-destruction with cabalistic ceremonies. This incantation was so dreaded that persons who learned that it had been directed against them were often known to die of fright. A Malay desiring revenge repaired to a medicine man, who made an image of his client's victim, and, muttering a spell, fastened it to a tree by driving a sharp point through the navel until the sap of the tree ran through the hole. The oozing sap was believed to be the life-spirit of the victim, who, it was supposed, directly began to suffer from a deadly ulcer which could only be cured if a friend secured a piece of wood from the tree to which the image was attached. When so extreme a revenge is not desired, many formulæ prescribe that the eye of the image may be pierced to render the victim blind, that the stomach may be pierced to make him ill, or the head to give him a headache.

Sometimes the effective similarity is between two actions. This is often true of many war dances, performed before going to battle. The Iroquois Indians pick out a rotten log to represent the enemy they are about to attack. This

they put in a hole in the ground, and, dancing about it and jeering, they hurl their lances into it, crying "Where is your power now? My lance is in you to the hilt." Their actions and their jeers insure a similar victory over the real enemy.

But imitative magic is not always employed for such cruel and gruesome ends. It is equally popular as an agent for realizing happier and more gracious desires.

The ancient Hindoos made use of the waxen image to obtain favors of love. With a bow of black ala wood strung with hemp and an arrow barbed with a thorn, the heart of the effigy was transfixed, while incantations were recited.

Young Ojibway men and women carried about with them little images of the person whose love they wished to win. These were regularly pierced through the heart and magical powders were rubbed into the hole. A common practice of ancient witches was to melt a heart of wax in order that the heart of the loved one might also melt.

Ceremonies clearly based on the principle of imitative magic are often also resorted to, to increase the supply of food. Thus, among the Arunta of Central Australia, one of the clans is charged with the propagation of the witchetty-grub, an important food staple. This is accomplished by elaborate ceremonies in which such propagation is enacted in pantomine by members of the clan decorated in imitation of the appearance of the insect, in the belief that the number of grubs are thus multiplied and a plentiful harvest is assured.

Almost halfway around the world on the coast of British Columbia where the people are largely dependent on salmon for food, small fish forms are whittled out of wood in order that the salmon may propagate.

Numberless are the imitative devices to secure success in hunting. The unsuccessful Cambodian hunter, in order to change his luck, strolls in the direction of his nets and, pretending that he does not see them, lets himself fall in, saying, "Hello, what's this? I'm afraid I'm caught."

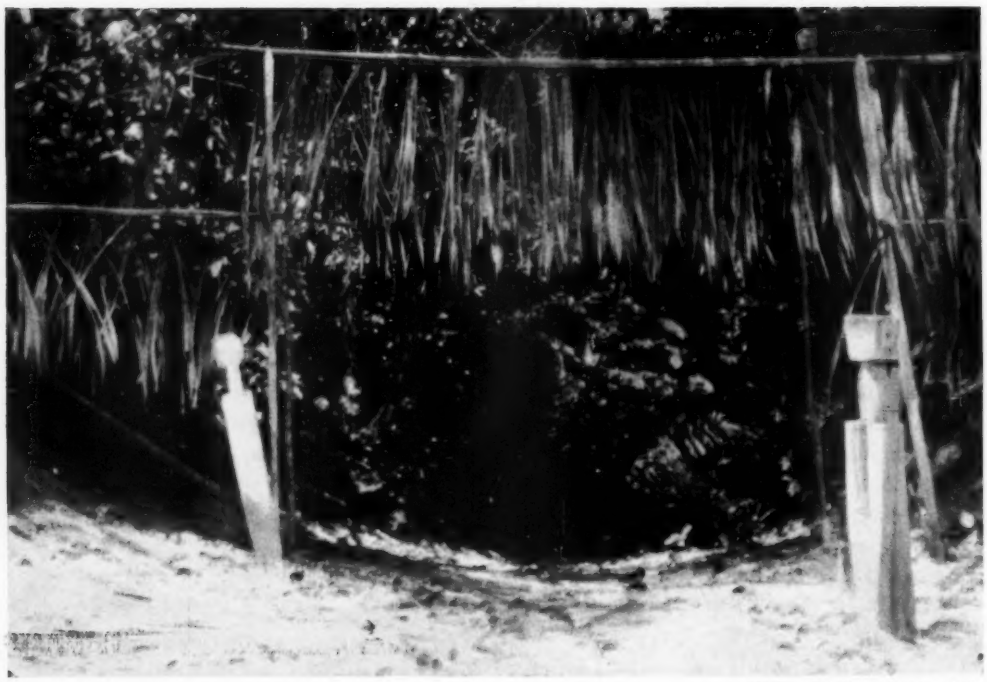
A Malay, watching crocodile traps, must gulp down the first three mouthfuls of his curry, just as he desires the crocodile to swallow the bait. Accordingly, a friend must take out all the bones, lest the hunter find himself in the position of having to choose between swallowing a bone and losing a crocodile.

The imitative potence of a charm may lie in the meaning of the words. Thus a Malay hunter may use the following incantation to create in himself the power to face the dreaded tiger, and to strike fear into the heart of the beast:

"Oh Earth-Shaker, rumble and quake!
Let iron needles be my body-hairs,
Let copper needles be my body-hairs!
Let poisonous snakes be my beard.
A crocodile my tongue,
And a roaring tiger in the dimple of my chin.
Be my voice the trumpet of an elephant,
Yea, like unto the roar of the thunderbolt."

Sometimes magical lore prescribes certain precautions to avoid the inadvertant touching off of triggers which might bring about misfortune. Thus, in Siam, where the resinous gum exuded by certain insects is used for food, all workers must refrain from washing themselves or combing their hair during the harvest, for the gum-producing insects might become detached from the branches just as the parasites are removed from their bodies.

Even the actions of persons far away from the scene may by some fortuitous similarity influence the success of an exploit. While the Eskimo crews are at sea hunting whales or walrus, no work which necessitates pounding or hewing or any general commotion must be undertaken at home, because the game might be frightened away. Nor must the



Photographed by Morton Kahn

A PHANTOM BARRIER AT THE ENTRANCE TO A BUSH NEGRO VILLAGE
As the palm fronds brush the backs of the visitors, any evil motives they may have are wiped off. The approaches to all the Bush Negro villages of Dutch Guiana are protected in this manner

bedding be raised and shaken, for if it were, the ice would crack and drift off under the hunters' feet. The wife of an elephant hunter in Laos must not cut her hair nor oil her body while her husband is on the chase. Cutting her hair would cause the elephant to break his bonds, and oiling her body would render her husband "butter fingered," and the game would slip through his hands. The Gilyak of Siberia believe that if the children make drawings while the father is away from home, the paths of the forest will become as perplexed as the lines of the drawings, and he will most certainly be lost. When writing was introduced, the people were aghast at the thought of the dangers to which so complicated a form of drawing would expose the hunters in the woods.

The medicine man makes use of imitative magic as a cure for many ills. The following illustration from the Dyak of Borneo could be duplicated from many parts of the world. The medicine man called in to a case of serious illness will pretend himself to be dead. He will be treated exactly like a corpse, wrapped in a shroud and laid outside on the ground. After about an hour, other medicine men will undo his bonds and bring him back to life. As he revives, the patient is supposed to recover too. A somewhat different application of the imitative principle is evident in the prescription of Marcellus of Bordeaux, court physican to Theodosius the First. In order to cure a tumor, take a root of vervain, cut it across, and fasten one end of it around the patient's neck, letting the other end hang in the smoke of a fire. As the root dries up in the smoke, so will the tumor also dry up and disappear. However, if the patient should afterward prove ungrateful to the physician and not pay the

required fees, it is only necessary to drop the root into water, and as it absorbs moisture and swells, so will the tumor return.

The second principle of magic, that of contiguity—that between things which have once been associated with each other there is a bond of potential power—is equally widespread and is often found combined with the principle of imitation. Thus nail parings, pieces of hair, drops of sweat, shreds of clothing, or remains of food belonging to the persons toward whom a spell is directed, are often important ingredients in the formula. It has been remarked by travelers that this belief is an effective agent for cleanliness, since people, fearing that an enemy may gain possession of something which has once been in contact with their persons, take scrupulous care to dispose of any offal which might open an opportunity to do them harm.

The details of the York murder reveal this principle behind the magical practices of the Pennsylvania Dutch. The defendants claimed that they had consulted another witch doctor as to how to rid the vicinity of the malignant sorcerer who had been bringing misfortune on his neighbors. The witch doctor had instructed them to obtain a lock of the man's hair so that a spell might be directed against him. When the defendants attempted to take the lock, the "hexer" resisted, and it was in the ensuing struggle that he was killed.

Often it is not necessary that the object through which a charm may be made effective has so close a personal contact with the individual it is to effect. Implements once used by the victim may serve as well, or any object which he has touched. Footprints or impressions of his body on the ground may also be used. Even the length of the footprint is a factor in one Malay recipe.

An Ainu woman will attempt to get rid of her husband by wrapping up his

Photograph by Herbert Lang

AN AZANDI WITCH DOCTOR DIVINING WITH AN EGG

A common method of divination in the Congo is to press an egg between the knees. Whether or not the egg remains whole, is the point on which the outcome of the event in question is foretold. If an egg is held squarely from end to end, it is very difficult to break it

headdress in the shape of a corpse and burying it in the ground up-side-down, while she breathes a prayer that he may rot and die with the headdress. On the other hand, in the interests of domestic harmony, the natives of New Caledonia tie firmly together two spindle-shaped bundles made up of specified ingredients including threads from the woman's girdle and from the man's apron. The talisman is said to render the union of the spouses indissoluble. If, nevertheless, a domestic jar should occur, the husband fumigates the bundle, and sprinkles it with water from a prescribed source. He then performs certain rites and stirs the needle in the bundle, saying "I change the heart of this woman that she may love me." If this treatment is ineffective, he ties a sugar cane to the bundle and sends it to his wife through a third party. If she tasts of the sugar cane, she will feel her love for her husband revive.

The widespread notion that the treatment of a weapon affects the wound it has inflicted, is another expression of contiguous magic. In Melanesia, when a man has been wounded, his friends make every attempt to secure the arrow with which the injury was done. If they succeed, they wrap the weapon in damp leaves and deposit it in a cool place, that the wounded man may not become feverish. Meanwhile the enemies will be chewing irritating leaves or drinking hot and burning juices in order to inflame the wound. Or, if the enemies retain possession of the arrow, it is thrown in the fire so that the wound may burn as well. And occasionally they amuse themselves by twanging the bow-string in order to give the injured man a similar twinge of pain. This idea is not limited to primitive people, but is firmly believed in rural communities in parts of England. A conscientious groom will carefully grease each day the nail which has penetrated one of his horse's feet, in order that the cut may heal quickly. A Suffolk farmer who had scratched himself with a thorn, on being told by the doctor that his hand was infected, exclaimed "That didn't ought to for I greased the bush well arter I pulled it out."

The question perpetually arises "Why do people continue to believe in the efficacy of these practices which must time and again and over countless ages have proved themselves utterly futile?"

There are in the first place several simple alibis which may account for the failure of a charm and keep faith in it alive. Perhaps some unfortunate slip was made in carrying out the ritual. Something may have been touched with the right hand instead of the left, a word in the incantation may have been mispronounced, or the steps of the procedure may have been taken in the wrong order. Often specific antidotes for charms are known, such as that of obtaining the wood of the tree to which the effigy is attached, in one of the Malay charms described; and the possibility that someone has pronounced an even more potent spell to counteract the first, is an ever appropriate alibi.

Moreover, there are the convincing cases when the end to which the magic is directed is in one way or another actually attained. Sometimes the ritual is accompanied by practical means of bringing about the same result. Again there are the cases in which the power of suggestion or fear may operate, as in Australia, where people may actually die of terror when they realize that certain spells have been directed against them. And often the time in which a given charm must take effect is not set, and a coincidence may validate the efficacy of the magic. Every observer of human nature will recognize how effectively such occasional successes serve to imbed belief. A black cat may cross the path of hundreds of people without any serious consequences.

But let the black cat once cross the path of a person who is subsequently run down and injured by an automobile, and the whole neighborhood will walk miles out of its way to avoid the haunts of the innocent grimalkin.

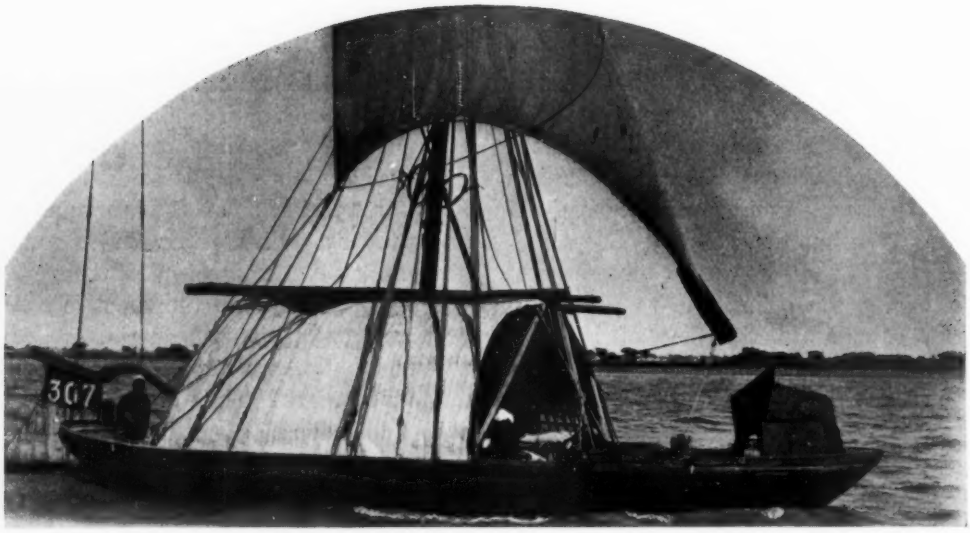
These factors, however, only serve to bolster up the belief, and to prevent it from slipping in the face of repeated failures of the sequence. But the belief itself is established in the first place because it is part and parcel of the education which is handed on from generation to generation. And this education recognizes as the highest authorities in the community the sorcerers, whose prestige in turn depends on their sanction of the fundamentals of magic.

The dependence on the best authorities at one's command is no special characteristic of a primitive or ignorant mind, for it would obviously be impossible for each man to test out for himself each fact which he is willing to accept. We all firmly believe that the stars are universes an incredible distance away. We believe it because the authorities on the subject, the astronomers, tell us so—or more likely because someone has told us that the astronomers say so. How many of us are familiar with the telescopic apparatus and the mathematical calculations which are the only means of ascertaining that the stars are anything but needle-pricks of light in a dusky dome? Every careful and intelligent housewife is scrupulous about the use of disinfectants in her home, but has one in ten thousand of them ever observed at first hand the effect of such preparations on living bacteria, or even the effect of malignant bacteria on the human organism? They continue to act, as indeed they must, on the basis of what is sanctioned by the highest authority each one recognizes, whether that be a street-car advertisement or a publication of the Department of Agriculture.

So countless people from sea to sea, who have not followed the modern Twentieth Century mode of shifting their authority from the folk knowledge of the past and the medicine man, to fourth or fifth-hand reports on the controlled observations of science, still act on the belief that a mysterious and compelling power is latent in the bond between like things, or things which have once been in contact with each other, and that this force can be manipulated at will if one is possessed of the formula by means of which it is rendered active.

Courtesy of the Museum of the American Indian

In South America, where the perils of the teeming jungle are ever present, the resources of the witch doctor are in constant demand. Even sceptical white visitors have reported that these crafty and able practitioners can in some inexplicable manner accomplish what seem to be impossible things



One of the expedition "nuggers," a common type of Nile sailing craft

GLIMPSES ALONG THE WHITE NILE

An Account of One Phase of the Taylor-Sudan Expedition—Natives, Animals, Fish, and Birds South of Khartoum

By H. E. ANTHONY
Curator, Mammals of the World, American Museum

PHOTOGRAPHS BY IRVING K. TAYLOR AND H. E. ANTHONY

THE Taylor-Sudan Expedition of 1927 spent the months of January, February, and March, in collecting museum material along the White Nile and its tributaries from Khartoum south almost to the border of Uganda. During this time many species of mammals, birds, and fishes were taken, and the material and studies for two groups, white-eared kob and Nile lechwe, were secured. The resulting travel afforded a fairly representative cross section of the White Nile region and brought the expedition into contact with many interesting animals and primitive natives.[1]

Mr. Irving K. Taylor, the sponsor of the expedition, held a charter for one of the Nile shooting steamers, to take effect about the middle of February, and we had arrived in Khartoum early in January. While waiting for the steamer, two native sailing boats, known as "nuggers," were fitted out to serve as floating collecting stations, and we set out to work along the White Nile from the immediate vicinage of Khartoum southward as far as our time and slow-sailing schedule permitted. By thus working the stretches of river near Khartoum we could pass them without any stops, once we had taken over the shooting steamer.

Fortunately for the Nile sailing craft, the prevailing wind during a large part of the year is from the north. This wind will sail boats south against the descending waters of the Nile, and when one wants to turn about and come north, the sailing boat can either drift down with the current or wait for a tow from the post-boat or other passing steamboat. The nugger cannot sail into the wind or even approximately into that quarter. Where the Nile makes a bend and the wind ceases to come from astern, the

[1] See "With the 'Fuzzies' after Ibex," NATURAL HISTORY, Vol. 27, pp. 601-614.

nugger proceeds at a snail's pace and all hands take to poling, the Arabs keeping up the continuous chant which seems to be necessary to all Arabic labor.

We tied up along either bank of the Nile, according to the collecting conditions, and spent most of our time at this stage of the expedition building up a representative series of bird skins. Small mammals were trapped wherever it was possible to set out a line of traps, but continuous shifting of position interfered with this phase of activity.

The sand-bars and banks (wherever they were open and not covered with dense stands of rushes and grass) teemed with water fowl. Great flocks of cranes were almost constantly in sight, either looming up above the mud flats like detachments of infantry or strung out across the sky in long flying columns, with trumpets sounding to keep the order and marshal laggards into line. The clarion call of the crane carries for miles, and a flock might be heard while yet so distant as to be all but invisible. Many varieties of ducks were encountered, some of them species that are resident and nest along the Nile, others that are migrants from Europe and Asia and merely spend the winter in the Sudan. One of the commonest of the ducks is the whistling teal, a small duck with an even smaller whistle, a weak "little-bird" sound that floats down from a passing flock as one of the most characteristic bird sounds of the White Nile. Geese of several species, storks in variety, kites in abundance, and a host of other birds such as ibis, herons, terns, sandpipers, hawks, et cetera, made up an assemblage that was always a numerous and, at times, a vast congregation of feathered life. Back from the river bank, in the areas of sparse, thorny scrub, or in the occasional regions of low forest, the land birds

A GALA OCCASION

A newly appointed governor was expected to make his first call at Jebelein and the natives of the region had gathered to welcome him. An abundance of red and white bunting draped tall poles and the booth that commanded the landing from the steamer

MOHAMMED SULEIMAN, MR. ANTHONY'S SHIKARI

In the Sudan the shikaris are registered by the British officials, and at the conclusion of the trip must secure a satisfactory recommendation from each party they guide

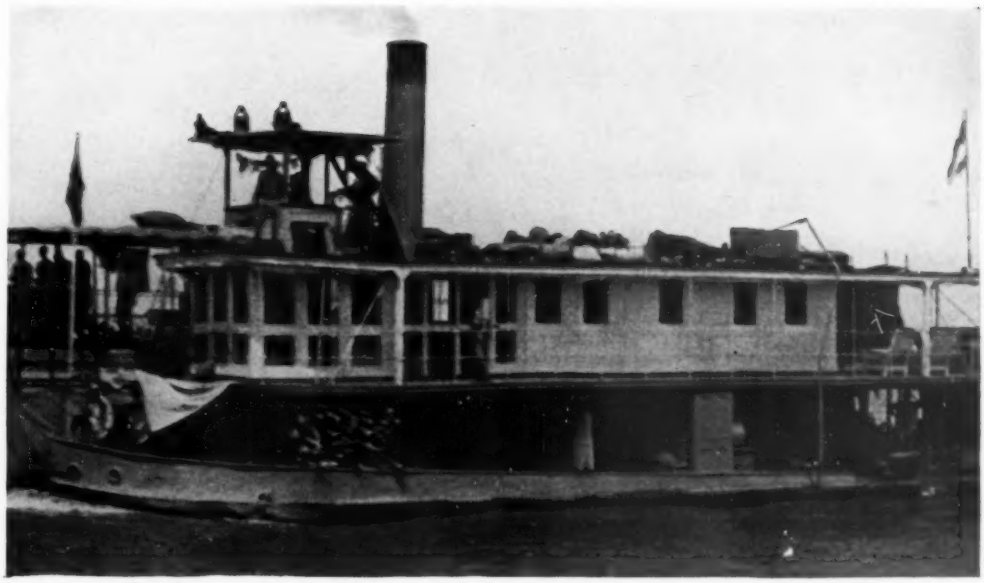
always presented interesting features. Guinea fowl flew up with terrific clamorous din when the hunter walked into a flock; long-tailed, glossy starlings shone in the bright sunlight with a metallic luster; and the bright-colored bee-eaters gleamed against the blue sky as spots of green or rosy red. From the trees along the river, or over the numerous khors or backwaters, we often started flocks of black ibis that announced their alarm and displeasure in raucous outbursts of what sounded like grating laughter.

While on the nuggers, we did not sail far enough to the south actually to enter the big game country, although we reached the northern limit of it. At Akona, one evening, we almost heard a lion. A distant, rumbling roar seemed to be possible of only one interpretation, and I set down in my notes of that day that I had heard my first wild lion. Mr. Taylor was dubious but could not satisfactorily explain the noise otherwise. The next day we heard the lion again, in the forenoon, and the animal was apparently closer. Investigation disclosed that our Arab captain, or "reis," was asleep between decks and snoring. This rather weakened my confidence in the journal entry of the day before. However, we did hear bona-fide lions at that place several nights in succession, and I shall always believe that the first night we were serenaded by Leo and not by the reis smuggled off for a cat-nap under the deck.

Although we hunted for lion at this place, found fresh tracks, and lions were seen twice by natives while we were tied up to the bank of Akona, we were not fortunate enough to see one. Later, along the Bahr-el-Ghazal, at a place where we had hunted on two occasions, a

THE SHOEBILL STORK

This large bird, (*Balæniceps rex*), known also as the whale-headed stork, feeds on small fish which it catches by standing quietly in shallow water until a fish swims by



THE "BEATRICE," A SHALLOW-DRAFT RIVER STEAMER
Because of the high superstructure, these boats always have one or more barges lashed alongside, both to prevent the wind from capsizing the steamer, and to afford additional deck space for the wood which is used for fuel

few days prior to the incident, and again but two or three days afterward, the unfortunate Count Hunyadi encountered a lion and was fatally mauled. He wounded the lion, followed it into the tall grass, evidently in the belief that the animal was helpless, and unexpectedly walked on to it. The lion was upon him before he could shoot, and bit both the Count and his shikari severely. The native recovered but the Count died of blood poisoning before the steamer could reach Khartoum on its hurried return.

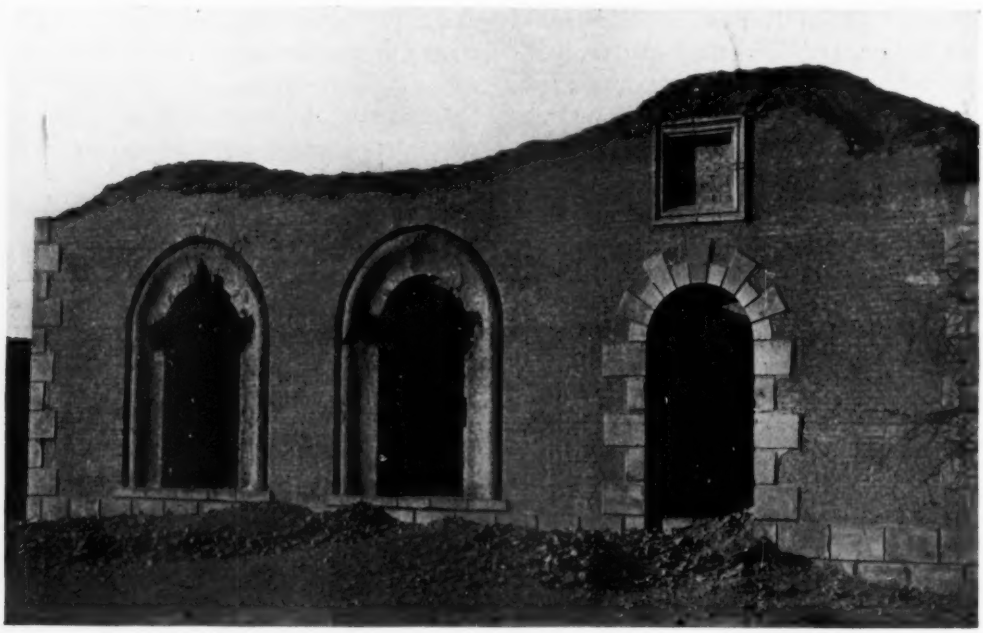
At Akona we had our first glimpses of Shilluks, a tribe of tall negroes who live along the Nile and hunt and fish for a living. The Shilluks are fine physical specimens, many of them well over six feet tall. They are frequently to be seen spearing fish from canoes or rafts of ambash, a very light, porous wood. The water of the White Nile is so loaded with sediment that one can seldom see fish in it. It is possible to see the swirl made by the fish, but not the outline of the fish itself. The Shilluk drives his spear at random into the water, patiently throwing again and again and apparently not discouraged by the many times that his spear strikes nothing. By fishing along the edges of the reeds and in the likely places, the natives secure many fish, however, by this haphazard method.

Throughout most of the river system fish abound. We were collecting specimens for the American Museum and detailed a native to cast a net at each place we tied up. Another native set out hand lines, and between these two methods we had the pick of hundreds of fish. Some of the Nile fish are remarkable for their size or structure. The Nile perch attains a weight of more than two hundred pounds and is much sought for by fishermen. A species of catfish is equipped to deliver a severe electrical shock to any animal that grasps it, and one caught on a line provided us with a unique sensation when we tried to lift it out of the pail. If grasped so that the fingers touched the

fish on the right and left sides simultaneously, the shock was quite enough to make one drop the catfish immediately. A lung-fish, found in the backwaters from the Nile, buries itself in the mud when the sloughs dry up, and, by means of functional lungs, is able to live out of water for weeks at a stretch.

Most of the terrain along the Nile is monotonously flat, but at long intervals there are detached rocky hills or "jebels." We spent several days at one such rocky outcrop located at Jebelein. Here we found animal life different from that we had been seeing on the plains. The rocks are the home of the rock hyraxes or conies, thickset, tailless animals with bodies about as large as a plump house cat. The hyrax belongs to an order by himself, not very closely related to the other orders of living mammals, and related in some characters to the proboscidians. This animal is mentioned several times in the Bible, and one passage, Proverbs 30:26, states that "the conies are but a feeble folk, yet make they their houses in the rocks." There were leopards about the rocks, but we had no success in our search for them. The only leopard bagged by the expedition was one shot on the train at Atbara when it broke loose from a shipment of live animals being sent out to the United States from the Zoo at Khartoum. While the situation contained great possibilities in the way of excitement—there were many people about and this leopard was noted for a bad disposition—the animal was killed before it had any chance to make trouble.

At Jebelein, and later at Mongalla, I tried hunting at night with a headlight. The light "shines" the eyes of mammals and the method is remarkably successful as a means of securing museum specimens. In the United States it is known as "jack-lighting" and is forbidden by law, not only because it is dangerous to hunt this way about dwellings and where there



THE TOMB OF MAHDI

This shrine, second only to Mecca for the faithful Mohammedan, was built by the Khalifa Abdullahi upon the death of the Mahdi or "Deliverer." It was almost demolished by the artillery of Kitchener's forces when they took Khartoum in 1898 and overthrew the Dervish empire

THE HOME OF CONEYS, GENETS, AND LEOPARDS
Because the prevailing topography is flat, the hills at Jebelein are landmarks for a considerable distance, and loom up out of all proportion to their meager elevation

is domestic stock, but because it is a deadly method when employed against deer. By means of the light, a museum collector can often secure specimens which he would not otherwise obtain, and in remote regions there is no risk involved except to the hunter himself, as for example, should he encounter a lion or a leopard. "Jacking" occasioned no little amusement to my native assistants and gun-bearers. Unable to see anything at a distance themselves because the light reflected by the animal's eye is visible only in the direct line of the light, they could not understand how I was able to fire apparently at random and bag a hare, a nightjar, or a genet, when all to them was utter darkness. Such a performance seemed so uncanny that it gave the natives great confidence in what the white man could do. This confidence was rather rudely shattered, in the case of Ali, the bird-skinner, one night at Jebelein, when I wounded a genet in the rocks and he rushed in to retrieve the fierce little carnivore. In the excitement of the moment he seized the genet with his bare hand about one-thousandth of a second before the genet seized him and began going over his hand to find a spot that really suited. We got the specimen.

On the seventeenth of February we took over the "Beatrice," the shooting steamer, and made as direct a run as possible for the big game fields, stopping only to take on firewood and to pick up our shikaris and gun-bearers en route. After entering Lake No, we began to devote most of our time to the larger mammals, the bird work being incidental. Along the Bahr-el-Ghazal we encountered large bands of white-eared kob and numerous waterbuck. Our program was to steam up the narrow river, with several of our keen-eyed natives on top of the engine house on the lookout for game. We watched also, except when at meals, but throughout the daylight hours one

DWELLERS ON THE WHITE NILE
Shilluks, one of the most picturesque of the Nilotic tribes, are tall negroes who lead a carefree existence hunting and fishing

or more of our six shikaris and gunbearers were always looking out over the plains. Whenever something desirable was sighted, the "Beatrice" was pulled over to the bank, and a hunting party went ashore. At certain localities known to be good hunting ground, the steamer was laid up for several days at a stretch.

We passed almost a constant procession of animal life. In the river itself we saw hippopotami daily; often, for long stretches, we would not be out of sight of one or more of these huge "river-horses." Crocodiles are plentiful in the Nile, but we saw comparatively few, because the river was high and there were not many sand-bars or bare banks on to which they could pull out. Back from either bank of the river the game herds varied from bands of elephants, giraffes, buffaloes, or antelopes, down to solitary gazelles or reedbucks. One assemblage of giraffes was scattered along the north bank of the Bahr-el-Ghazal for at least three miles, a great herd that dominated the landscape because the necks of the animals were taller than the scrub forest and their heads came up above the tree tops. The giraffe is an animated observation tower and it is well-nigh impossible to stalk one, under ordinary circumstances, because of the commanding position its eyes have above everything about it. As well try to hide from a bird!

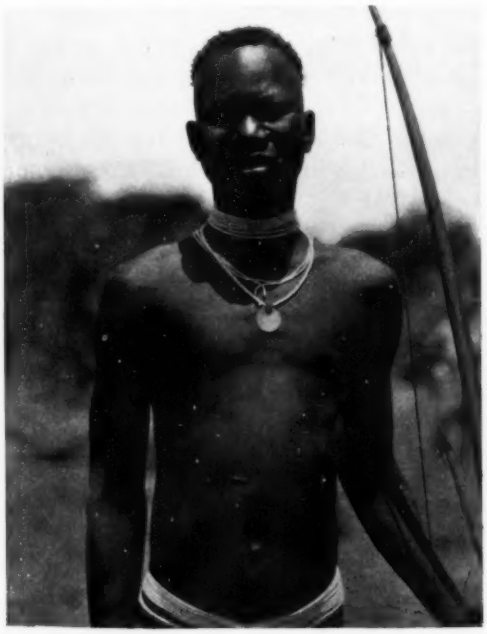
When the steamer was tied up to the bank, care had to be taken that no gang planks made contact with the shore overnight. On the one occasion when a plank thus spanned the water from the deck to the earth, myriads of fierce ants swarmed aboard. We had six donkeys stabled on the barge that was lashed alongside the "Beatrice," and the barge had an iron deck. Toward morning we heard a constant stamping from the donkey quarters and wondered if the

A NUER WARRIOR
The Nuers are war-like people, and in times not so far distant raided their neighbors, the Shilluks and Dinkas, for slaves

mosquitoes were disturbing them. With daylight we found the barge acrawl with ants which were concentrated in force about the carcass of an antelope that had come aboard too late to be skinned the day before. Along one side of the antelope most of the hair had been cut off as with a razor. As the ants had increased in number, scouting columns left the antelope in the center of the barge and explored for other plunder, attacking the donkeys and routing out the natives sleeping on the barge deck. For some time the crew was busy sweeping ants off into the river and driving the raiders out of the corners with hot water.

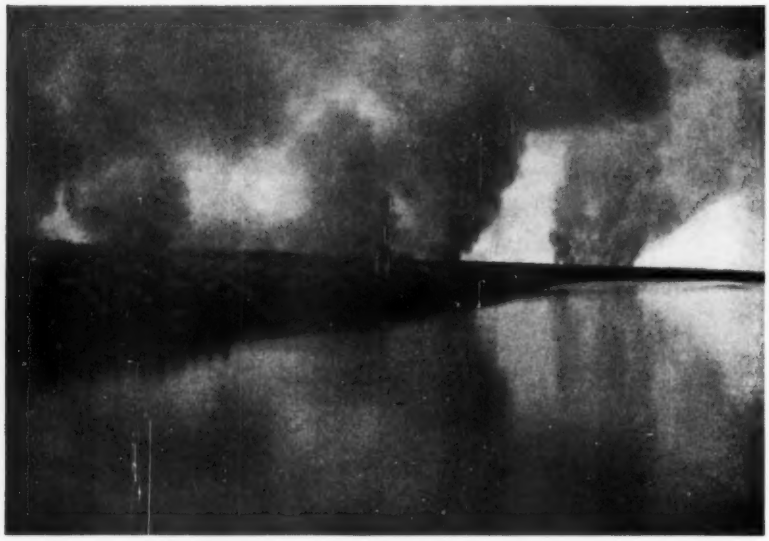
In most years the waters of the Nile recede with the passage of the rainy season, and as the dry season advances, the falling rivers drain off all of the bayous and back-waters. The grass along the river banks and for great distances inland becomes dry and yellow.

ACTORS IN A MIMIC LION HUNT
At Wad Akona a small band of Shilluks staged a mimic lion hunt. The negroes acted out this dance with intense enthusiasm



A DINKA HUNTER
The Dinkas scarify themselves on the head and body with conspicuous welts arranged in patterns which undoubtedly have tribal significance

The natives set fire to the dead grass in order to clear the ground for the new grass. After the grass has been fired, the plains are so devoid of cover, in many regions, that it is possible to see game for great distances. During the early part of 1927, the Nile failed to recede as usual. The height of the river remained almost at the level of the rainy season and the papyrus and grass stayed green, too damp to be burned off. The burned-over areas were small and scattered, and game might be very abundant and yet be hidden in the rank growth of grass and rushes. The Sudd was scarcely touched by fire, and here the papyrus grew to a height of ten or twelve feet, or even more in some places. Bands of elephants were completely concealed by these giant rushes and we were made aware of their presence only by the movements of the white cow-herons that continually fly up about herds of elephants, and by an occa-



A FIRE IN THE SUDD

Although the situation seems fraught with great possibilities for destruction, apparently all the papyrus of a given area does not dry at the same time, and the fires burn themselves out without doing any great damage. The herds of game move ahead of the blaze and are seldom trapped by fire

sional trunk that writhed up out of the green ocean, like a great snake rearing its head. On rare occasions we saw elephants in more open localities and had good opportunities to observe them. One such herd contained from fifty to seventy-five individuals.

Just south of Mongalla, near the Lado, we made our southernmost stop, and after some interesting experiences at this place, Khor Suleiman, the "Beatrice" was headed north for the return to Khartoum. At Khor Suleiman and at Sim Sima, a short distance down the river, we had our most exciting moments of the expedition, with buffalo. The African buffalo is an uncertain beast and although he never is wantonly aggressive, when man has crowded him too far, he is ready and eager to make trouble.

At Sim Sima Mr. Taylor and I had stalked a small band of seven or eight buffalo. We were in close and each shot at an animal. One buffalo fell after running but a short distance, the other left the spot with the herd. Mr. Taylor

A NUER VILLAGE DWELLING

The Nuers are rather more warlike than the Dinkas and Shilluks and frequently make trouble for the British who organize punitive expeditions to chastise the particular group of natives that cause the trouble. The expedition visited a Nuer village at the mouth of the Bahr-el-Arab

SEEN FROM THE DECK OF THE "BEATRICE"

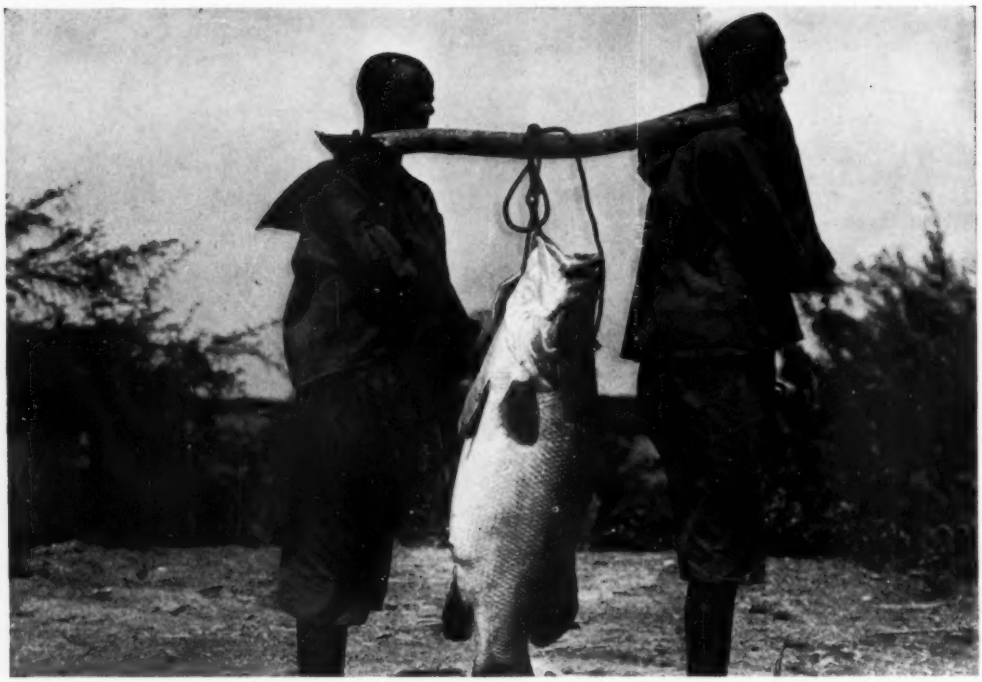
Occasionally it was possible to secure photographs of elephants seen in the more open spots in the Sudd. It would have been useless to attempt photographs of them from the ground since they had but to take a few steps to be lost in the green ocean of papyrus

started to follow the wounded animal, while I, with my shikari and gun-bearers, turned aside to see what had happened to my buffalo, off to the left in brush and high grass. I glanced back at the other party once more, before giving my complete attention to my own errand, and was appalled to see one of Taylor's shikaris running for his life just ahead of a charging buffalo, and bringing the animal right back through Taylor's party. I could not shoot at that moment for the men were scattering like a covey of quail between me and the charge, and I was as likely to hit one of them as the buffalo. Taylor's gun was with his gun-bearer and it was every man for himself. The native and the buffalo disappeared beyond a screen of thorn and scrub and I waited for them to emerge. I never saw that buffalo again.

The buffalo had caught the native, but missed the man with its horns and merely pitched him head foremost into the bushes. Apparently satisfied with this, the animal swerved aside into near-by cover and

HUTS OF THE DINKAS

These huts are crude structures made of poles and thatched with long grass. Dinka villages are scattered along the Nile, but none encountered by the expedition were very large. The Dinkas own large herds of cattle, and during the day the men of the village are out attending them



A NILE PERCH
This 45-pound Nile perch (*Lates niloticus*), taken on a rod and line at Lake No, was but a small individual compared with full grown ones which sometimes reach a weight of 200 pounds

went off to seek seclusion. The shikari, aside from a great bruise where he was struck and sundry cuts and scratches where he landed, was not seriously injured. He was singularly fortunate, for the odds were greatly against his coming out of the episode alive. He told us, afterward, that the buffalo was standing back of a bush waiting for the hunter to follow the track in and had taken this early opportunity to retaliate.

By the time we returned to Khartoum, March thirtieth, we had enriched the Museum collections by a series of practically all of the big game of the White Nile region. We had seen no lions or leopards, and had made no attempt to take specimens of the elephant, giraffe, and hippopotamus, but with these exceptions the Museum had secured, thanks to the generosity of Mr. Taylor, a very good representation of the Sudan mammals as well as the birds and fishes of the White Nile. Two groups, the white-eared kob and the Nile lechwe, are now being mounted at the Museum from the material secured on this trip. The study specimens will be preserved in the various departments as permanent records of the Sudan fauna, and will afford invaluable data on the many problems of geographic distribution, specific and individual variation, and the various biological aspects which deal with the interesting life of Africa.

ISA, MR. TAYLOR'S SHIKARI, IS A TALL ARAB OF FINE PRESENCE

Photographed by F. E. Lutz

In the Brownsville region of Texas, the great western desert meets the moisture-laden winds of the Gulf

HONEY WASPS

The "Mexican Bees," Which Enter the United States at Brownville, Texas, Are not Bees at all, Although They Have a Bee-like Ability to Gather and Store Honey

By HERBERT F. SCHWARZ
Research Associate in Hymenoptera, American Museum

WHY not make a field trip to Brownsville, Texas, this winter?" The prospect of entering the land of sunshine where December seems May was altogether too alluring to resist. Accordingly I set out from New York on a rather unseasonably mild afternoon shortly after Christmas to join Dr. Frank E. Lutz, who had suggested the trip, in New Orleans and to proceed with him thence to our destination on the Rio Grande. I had been assured at the Pennsylvania Station that the train I was boarding was headed south but, as the day went by, I had difficulty convincing myself that I was not making for the boreal regions. Each hour it became colder and colder. The "sunny" South was wrapped in clouds and the farther south the train sped, the less promising conditions seemed to be. By the time I reached New Orleans my teeth were chattering. Some twenty hours later Doctor Lutz and I rode into Brownsville on the crest of a "norther."

We had chosen to come to the region at one of those rare periods when the local thermometer was near its low limit. But the warm hospitality of those at Brownsville did much to take the chill off the unusual weather. (At Brownsville, natives tell you, there are only two kinds of weather; fine weather and *unusual* weather.) With especial gratitude we remember the government taxonomist, Mr. Foster H. Benjamin, who placed his time at our disposal, taking us in his automobile to localities we could not otherwise readily have reached and with Mrs. Benjamin entertaining us in their home.

At first collecting was rather thin. Wind and cold and clouds kept the insects from emerging. We hunted about in thickets adjoining the old Mexican *resaccas*, breaking up decayed logs to uncover possible denizens, examining leaves and bark and crevices for insects that might have taken refuge there. For several days low temperatures and sullen skies prevailed, but in the end we almost blessed the persistence of the cold, for

WASPS ON THE ROOF OF THEIR DWELLING

Viewed from the outside, the paper nest of the honey-makers looks somewhat like that of one of our northern yellow jackets. Within, the architecture is very different. Instead of a series of horizontal combs that hang chandelier-like one below the other with pillar-like supports between, the nest of *Nectarina* consists of more or less spherical combs that are attached directly or indirectly to the envelope.

Photographed by L. Diguet

when the thermometer finally did rise and the sky cleared, it was as though the old fairy tale of the Sleeping Beauty had come true, with such abundant virility did dormant nature awaken after being under the spell of the cold.

The first feeble rays that struggled through the clouds had scarcely attracted our attention before the venturesome advance guard of the flower-visitors made its appearance. The flowers were so few that rather than risk breaking them by swinging the net and so destroy the lure, it seemed advisable to pick off the insects one by one with the narrow-throated killing bottle.

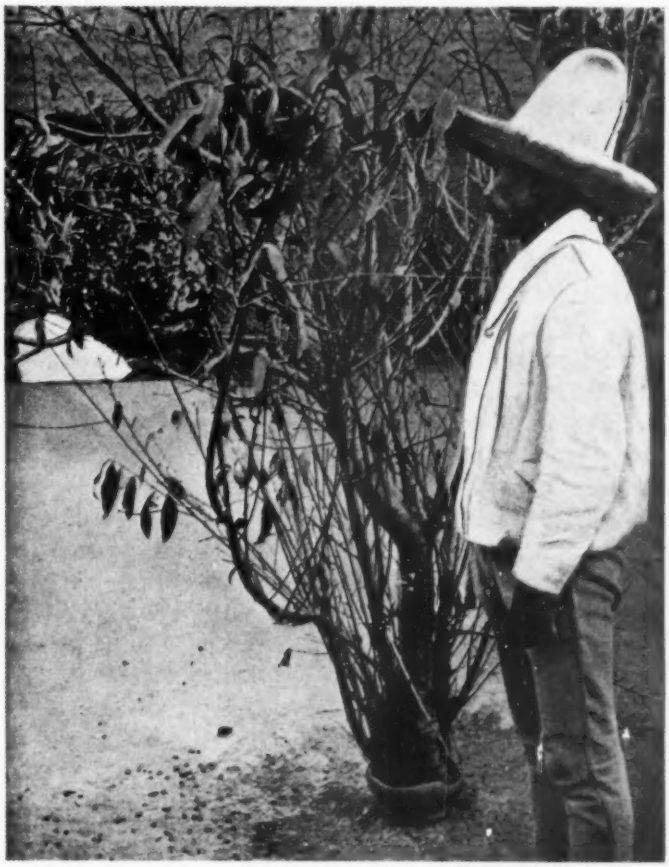
In succeeding days numerous flowers began to bloom, and the only limit then to the catch of bees and other flower-frequenting insects was our diffidence to take beyond a reasonable number the duplicate specimens that offered themselves. Unusually abundant were females of *Augochlora aztecula*, an Halictid bee originally described from Mexico. With their metallic green thorax appearing like a knightly cuirass, and the shimmering segments of their brassy abdomen resembling jointed armor, they suggested Amazons of the insect world engaged in a foray on the floral granaries.

An interesting circumstance connected with the catch of bees was the disproportion in the number of individuals collected. Thus out of a total of 370 specimens all but 13 were members of one family, the Halictidæ. Halictid bees share with bumble bees the distinction of being among the earliest fliers in the spring, and one is tempted to conclude that their large representation in the January fauna of Brownsville indicates that January in that region corresponds to say early May of the latitude of New York.

In the course of our sojourn we had heard frequent mention made of an insect that lives in colonies and produces honey. It was generally referred to by our informers as the "Mexican bee" because of the partiality of the Mexicans for the honey it produces. Some people told us that the insect did not sting, and this

aroused our curiosity more than ever. We asked ourselves: could it be that on American soil and in a region that is generally classed as desert, there flourished colonies of the stingless honey bees of the tropics, the Meliponidæ, generally associated with the hot moist regions? The words bee, honey, stingless, taken in association, all seemed to point to such a possibility. On the other hand, there were elements of doubt. Most people implied that the nests were of paper and this suggested the work of wasps rather than of bees. Also there were those who maintained that the insects were mild in their behavior rather than stingless, and that now and then at rare intervals individuals had been stung. These reports, so contradictory, needed verification, and so, when we were told that a nest of this type was located on a not distant plantation and that we might have it for the gathering, we gladly availed ourselves of the offer.

After an hour or two of travel by motor we reached our destination. There were four in our party, but there were many more people awaiting us in the home of the planter. I suspect he had "tipped off" his neighbors that there were some "fool fellows" from New York who had come to give them an afternoon's entertainment free of charge. At any rate, everyone came along with great alacrity to see the show. Even the dogs insisted on joining the party. And so we set off as though to tree a racoon instead of to gather a hornets' nest, for a hornets' nest that object in a low ebony tree surely seemed to be. It was well surrounded by branches and foliage that had to be cut away, but even these did not conceal the nest, and a black mantle of wasps was plainly visible over one entire side of it. Every time a branch was snipped with the shears and the nest thus shaken lightly, an angry hum arose from these congregated hosts. It sounded very menacing, but instead of turning upon the intruders,



Photographed by L. Diguet

A MEXICAN AND HIS HONEY SUPPLY

The honey bee is a denizen of the Old World and was unknown in the Americas until the European colonists introduced it. On the other hand, honey of the wasp *Nectarina* was probably relished by the pre-Columbian Indians as it is by the Mexicans of today

those of the wasps—for wasps they were—that roused themselves to flight, mostly flew away from rather than toward us. They well justified their reputation for unaggressiveness, and some of us even began to think that perhaps they were really stingless.

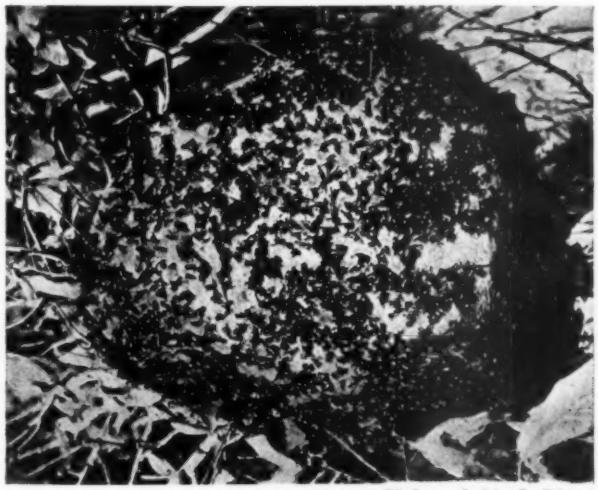
Doctor Lutz—conscientious scientist that he is—refused to have this point remain in doubt and to silence local sceptics forever after, he seized two of them—I mean the wasps, not the sceptics—and started to anger them. Hardly had he given them a rude jolt with his thumb when they retaliated with a rapier thrust that was thoroughly convincing—to Doctor Lutz at least. His audience did not feel the pain and so withheld judgment. At any rate, he seemed to think it necessary, in order to produce conviction, to extend his hand among the group of spectators and to tilt it so that every eye could see where the wasps had imbedded their sting. Then, feeling that he had made his point clear enough to win over the most confirmed doubter, he flicked the insects off and away they flew. But not all that there was of them took wing. The stings, like discharged weapons, were left on the field of battle. This is of rather curious interest, for it recalls the similar phenomenon in the case of our honey bee, which likewise loses its sting and, it is said, its life, in sheathing its weapon in its victim. The after-effects of the sting in Doctor Lutz's case were rather severe. Although he was stung in the hand, the pain extended up the entire length of his arm and was, in fact, most severe in his arm-pit.

After the nest was completely severed from the tree, it was dropped into a large sack, and over this sack was fitted another from above so that the imprisoned wasps could not make their escape. Then a suitable box was secured and the nest was expedited to the American Museum labeled "Handle with care!" You may be picturing to yourself the consternation of those at the receiving end as, in ignorance of the contents of the box, they started boldly to pry it open and heard the angry hum within, making them pause to hold a council of war before proceeding with their storming operations. But your mental picture has no basis in fact, for the instructions *handle with care*, like all similar notices, were given for the protection of the cargo, not to safeguard the recipients. They had already been safeguarded—if safeguard was needed—by a message sent in advance of the shipment; and on reaching the Museum the sack was exposed to the deadly cyanide before the nest was withdrawn.

A few days after taking the first nest we learned that there was yet another nest to be had for the gathering and, as we wished to have an opportunity to study the contents and structure, this nest proved a welcome supplement to the one taken for exhibition purposes. It was obtained without adventure—that is, no one was stung—and after the wasps inhabiting it had been killed, it was opened up for study. It is of some interest to note that neither larvæ nor honey were found, yet there was a strong smell of honey in the nest and chemical analysis of the empty cells would undoubtedly have revealed traces of it. We came to the conclusion that possibly this nest represented the winter stage of the colony just before the resumption of spring activities, and that as a result the cupboard was bare. Some days later I caught other wasps of this species visiting flowers, and it is likely that these were engaged in provisioning their nest. The number of insects in the nest we examined reached, by count, the impressive total of 15,000, and in this figure could not, of course, be included the insects that made their escape before the nest was detached from the tree. In this large total there was no insect structurally differentiated as a

queen, for the very good reason that these wasps, in distinction to certain other social Hymenoptera, have the egg-laying functions of the colony distributed among many individuals that are not distinct from the workers in external structure although of slightly greater size and more telescoped abdomen.

Males were present, possibly in the proportion of 1 to 15 of the population. It has been stated that "males always make their appearance in the second half of the more propitious season, that is to say at a time when flowers are most abundant and the population is very numerous." Certainly there were no evidences of race suicide in the nest of which we took a census, but recent memories of the inclement weather and the scant flora made the second half of the quoted passage seem inapplicable.



Photographed by L. Diguet

A THRIVING COLONY

Unlike the colonies of our yellow jackets, which dissolve with the approach of cold weather, colonies of these honey wasps occupy their nests perennially

These wasps bear the rather savory generic name *Nectarina*. The name of the species, *lecheguana*, has a less pleasing cadence, but it is significant of the wide range of this insect, being the name given it by the Indians of Brazil. In Mexico, where *Nectarina lecheguana* is well represented, the honey, according to du Buysson, is sold in the markets. It is sometimes poisonous, depending on the plants from which it is gathered—a statement which holds true also in the case of the honey of some of the Meliponid bees of the tropics. Especially is this true in times of drought when Daturas are the only plants that furnish alimentation to the visiting wasps. The honey is gathered usually in December. If the base of the nest is left on the branch to which it is attached, it is said the wasps will begin their construction on the same spot and that, as the population of the hive is large, reconstruction is rapid. Nests are of variable size, ranging from 18 by 20 centimeters to 41 by 52 centimeters.

Nectarina lecheguana, it is stated, withstands in Mexico frosts of severity, and certainly the Brownsville representatives of the species survived in impressive numbers the icy weather that was a test of their powers of resistance. Nevertheless, prolonged cold would probably be fatal. It is rather significant that the northern limit of these wasps seems to be the Brownsville region. A colony transplanted to Hamilton, Illinois, was unable to survive the winter. In northern Argentina, when frosts occur during the cold months of June and July, the *Nectarina* wasps, according to E.-R. Wagner, secrete themselves head foremost in the cells with only the tip of the abdomen projecting.

Although the insect was well known in the Browsnville region, it is of interest that its presence there was reported in scientific literature only as recently as 1922. This may serve to indicate how

many chapters still remain to be written before a well-rounded picture of our American wasps and bees can be obtained. Of other Hymenoptera that we took in the region, two at least—*Augochlora nigrocyanea* and *Colletes punctipennis*—had hitherto been known, so far as I have been able to ascertain, only from south of the Rio Grande. The specific name of the latter indicates a condition of the wing exceedingly rare among bees. Most of these insects have wings that are more or less uniformly clear or dusky, but in *punctipennis* the wing has a distinct pattern due to distributed spots of deeper color.

Our week to ten days at Brownsville came all too swiftly to a close and again we were compelled to turn northward. We were glad to have visited the region when we did. In the first place, it gave us the chance to witness the swift recuperation of nature after an unusual spell of cold, and in the second place we felt that, with the rapid settlement of the region, even a matter of months might witness transformations not much less marked than those which are eternally going on in our own city of unrest. Instead of a quiet little desert town, such as I had pictured to myself, we found Brownsville a thriving community, with every modern convenience, streets abustle with passing automobiles, electric bells regulating the counter movements of traffic, and real estate signs along the faultlessly paved automobile roads offering this unreclaimed field and that for cultivation. It is not hard to visualize what is bound to happen under such circumstances.

The region will still continue verdant and attractive, but it will be with the blossom of citrus growth and of other market products, and less and less with the wild bloom of the cactus, the huisache, and the Mexican mahogany. Let us hope that amid all the changes *Nectarina* and other representative groups of wild life may succeed in surviving, even if in diminished numbers!

Photographed by F. E. Lutz

A PALM GROVE NEAR BROWNSVILLE

The Rio Grande, muddy as the "tawny Tiber" itself, once bore the name of Rio de las Palmas thanks to the presence of these trees as it approaches the Gulf

Photograph by Huberti, Rio de Janiero

A view from the summit of Itatiaya

ITATIAYA
BRAZIL'S MOST FAMOUS MOUNTAIN

A Landmark of Southeastern Brazil Which Was One of the First Notable Peaks in that Country to Attract the Attention of Geographers. A Spot That Has Long Been Recognized as an Ideal Locality for Research in Geology, Botany, and Zoölogy

By ERNEST G. HOLT
Carnegie Museum, Pittsburgh

Illustrated with Photographs by the Author

AWAY back, in time so remote that geologists are loath to venture its calculation—æons before the birth of the Andes—there emerged from the waters of the South Atlantic a mighty chain of mountains.

Age succeeded age, and torrential rains, sweeping back to the ocean vast quantities of material from the precipitous slopes, left stark and naked great masses of ancient rocks.

Then another cataclysm shook the land. Right through the middle of the range a fiery finger of rock thrust itself upward until it towered well above the very highest of the old peaks.

This new peak, born of fire, then cooled and splintered. Relentless rains through other ages cut deep flutings into its sides, and trickled into every crevice. Recurrent seasons brought alternate heat and cold. And after the passing of still more ages, men—brown men—appeared, and, gazing in awe upon the majestic, shattered crags, called them in poetic fancy, Itatiaya—which means in their Tupi tongue, Multiplying Rock.

Time, moving more swiftly now, brought white men to this peaceful land, and they, after the manner of white men, were searching for gold. But Itatiaya held none and they passed it by. Hence, because it had no riches to offer, Itatiaya remained in obscurity until 1856. Today,

THE "HIGHEST HOUSE" IN BRAZIL
The government meteorological observer lives here the year around, high on the side of Itatiaya. The name of the mountain, translated from the Tupi Indian language, means "Multiplying Rock"

though France boast of Mont Blanc, the United States point complacently to Mount McKinley, or Argentina wax self-conscious over Aconcagua, for the true sons of Brazil the first mountain in all the world is their own Itatiaya.

The mountain rises at about 22° 24′ S., 44° 50′ W., in southeastern Brazil near the point where the states of Minas Geraes, Rio de Janeiro, and São Paulo meet, and is the principal peak of the Serra da Mantiqueira. Because of its situation midway between the two largest cities of the country, it was one of the first notable mountains of Brazil to attract the attention of the geographer, and for many years its altitude has been the subject of speculation. In the reign of the benevolent Dom Pedro II, a railway was constructed to link the capital with São Paulo, Brazil's second city, and this line, skirting the foot of Itatiaya and rendering the mountain really accessible, naturally lent impetus to this speculation. Pages upon pages were printed, giving various estimates and calculations of its height, but until 1911 no one had ever succeeded in scaling the last towering crags. And notwithstanding that the railway at its foot offered a base line of known elevation, it was not until 1922, ten years after Itatiaya's supremacy had been challenged by the Pico da Bandeira, of the Serra do Caparaó—and much newsprint had been expended in a bitter controversy—that any real effort was made toward a scientifically exact measurement of the height of the mountain. In that year, Dr. Adolpho Odebrecht, a government engineer, ran lines of levels up the two rival peaks and definitely relegated Itatiaya, with its 2790 meters of altitude, to second place by more than 200 feet. Nevertheless, Itatiaya remains supreme in the hearts of the people—a position to which it is justly entitled by reason of its superior grandeur and scenic beauty.

Such a mountain, rising well above all of its fellows at a point where the three greatest orographic systems of eastern South America—the Serras do Mar, da Mantiqueira, and do Espinhaço—closely

approach one another, has long been recognized by scientists as an ideal *locus* for research, and the region has been visited by many illustrious workers in geology, botany, and zoölogy. In these investigations the avifauna was not altogether neglected, yet so meager was the knowledge of the bird-life, and so great its potentialities, that the American Museum charged me in 1921 with an ornithological survey of the mountain.[1]

It was early on a December morning of that year that I found myself a passenger on the Estrada de Ferro Central do Brazil, slowly rolling out of the Rio de Janeiro station. My destination was a small town, shown on the maps as Campo Bello, about halfway up the line to São Paulo.

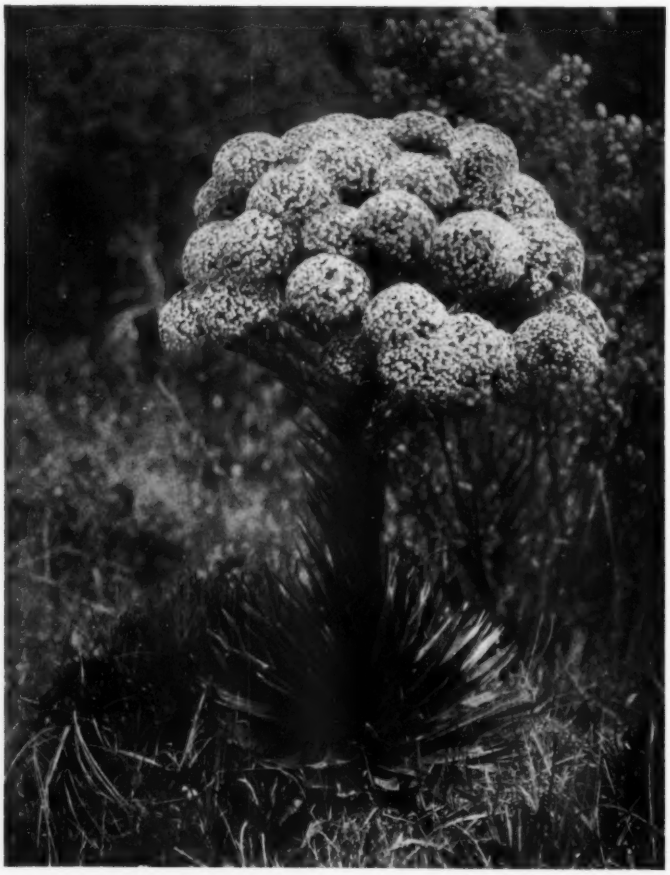
At noon I descended from the train at Barão Homem de Mello (the railway name of Campo Bello), fortunate in the possession of a letter of introduction to a local ranchman. He had been apprised of my coming, and no sooner had my feet touched the concrete than I was greeted by a gentleman in khaki who smiled a welcome through a rich coat of tan. A servant took charge of my bed-roll, and my host led the way to his home, almost lost amid a profusion of roses and vines and palms, behind a stately row of eucalyptus.

The garden, delightfully unkempt, was a riot of flowers and birds! The perfume of countless roses dominated all other odors; numerous mango, orange, and other fruit trees struggled under burdens of color—the most wonderful orchids I had ever seen; finches, ovenbirds, tanagers, and wrens sang everywhere and without pause. The whole world seemed flooded with sunshine and, although the elevation was but little more than 1300 feet, the air had a tang about it that was

[1]The scientific results of this survey were published in the *Bulletin of the American Museum of Natural History*, Vol. LVII, Article V, 1928.

PRATELEIRAS

One of the lesser peaks of Itatiaya, as seen from a spot near the weather station



A TEMPERATE ZONE BEAUTY
The striking plant (*Pæpalanthus polyanthus*) flourishes on the upper slopes of Itatiaya where the elevation creates a "temperate zone"

positively tonic. Even the mantle of clouds that had enveloped the summit of Itatiaya lifted to expose the final broken crags, naked except for a thin veil of mist swirling high above the last outposts of forest.

A number of years ago the federal government purchased the Serra do Itatiaya and attempted to establish on it a colony of immigrants. Upon the failure of the scheme, the mountain was turned over to the Botanical Garden of Rio de Janeiro and became the Reserva Florestal do Itatiaya. The headquarters of the Reserva, a group of buildings perched upon a deforested shoulder at about 2700 feet altitude, is designated as Monte Serrat. Here, as a guest of the government, I made my base.

Monte Serrat is nine kilometers from Campo Bello, and nearly 1400 feet above it, and is reached from the valley town by a cart road that leads northward into the mountains by way of the wide cañon of the Rio Campo Bello. Leaving the whitewashed houses on the banks of the Parahyba, this cart road first crosses an open expanse of pasture land and then passes through a narrow gap in the denuded foothills into a sort of basin where well-to-do men from the cities of São Paulo and Rio de Janeiro have purchased the abandoned colonists' lots and erected on them summer cottages. Here the Rio Campo Bello is called the Bemfica. (This remarkable stream changes its name as often as it shifts its course!) From this basin the road climbs laboriously over a forested shoulder into another larger basin, and comes to an end at the reserve buildings.

In former times the large *fazenda* of the Visconde de Mauá, which encompassed the whole mountain, made its headquarters at Monte Serrat, and much of the surrounding forest was cut over for timber, but later a still greater amount of clearing was done by the government in its ill-advised colonization scheme. This deforestation has allowed the tropical zone to advance above its normal limit of about 2000 feet altitude and form a pocket well within the subtropical zone.

Large tracts of the formerly forested area are now covered with a well-nigh impenetrable growth of giant bracken, beautiful to look upon, but a heart-breaking collecting ground. A little wren-like spine-tail (*Synallaxis spixi*) was very abundant in these fern tangles.

Monte Serrat proved to be the most luxurious field station that I ever occupied. I was assigned an end room in a long, one-story structure, and had ventilation through four windows and two doors. Besides, the room was furnished with a good iron bed, and was supplied with running water from a spring farther up the slope. The building even boasted a shower bath; and there were no mosquitoes! Certainly I had come to a summer resort to collect birds!

But I was soon to discover the fly in the ointment. There was another house opposite, and out of it each morning came a nondescript cur that rolled in the dirt and howled as if its heart would break. Naturally I inquired why the pup should be so disconsolate. "*Bernes*," was the laconic answer. Well, *bernes* meant nothing to me—then. A few days later I became aware of an irritating spot on my side, like the beginning of a small boil, but I thought it merely a "chigger," or harvest mite, applied the iodine, and tried to forget it. But it wouldn't be forgot. Then I realized with horror that I had a *berne* all my very own. When finally I got it out I found that it had burrowed in nearly a half-inch deep! Immediately a sense of fellowship with the cur across the way possessed me, and with a helper and a can of ether I went to his rescue. We took seven huge larvæ from his back, but had to leave as many more because the forceps would not grip them. They were hideous, repulsive things, as large as the distal third of one's little finger, and belted about with rings of retrorse spines.

A MOUNTAIN DAISY FIELD

Wild flowers were abundant, and the trail up Itatiaya passed through a meadow at 7500 feet altitude which was carpeted with daisies (*Eupatorium* and *Erigeron*)

THIS IS NOT A GLACIAL POND
Although this miniature lake has every earmark of having been created by glacial action, no glacier ever scoured the slopes of Itatiaya

The *berne* is the larva of a green fly (*Dermatobia hominis*) which exhibits to a remarkable degree that something we call "instinct" whenever we find ourselves unable to explain a psychological phenomenon in any other way. The animals which for generations have served as unwilling hosts to this parasite have learned to recognize the adult insect and will not permit it to come near them. But does the little fly in its modest coat of green suffer its kind to perish from the earth in consequence? Not at all. Lacking strength, it resorts to strategy, and seizing upon house flies, mosquitoes, and other flies smaller than itself, it fastens its eggs upon their bodies. These carriers, not being *verboten*, then visit some warm-blooded animal, the eggs hatch, the larvæ attach themselves to the new host, and the vicious circle remains unbroken.

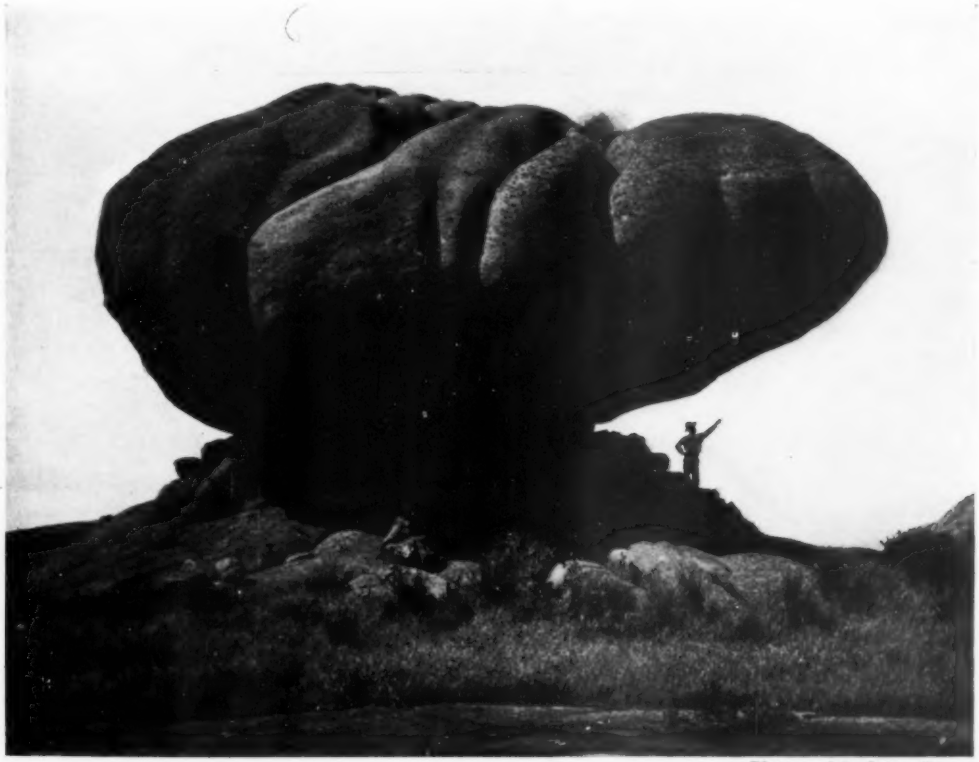
Shortly after my arrival at Monte Serrat a day was set for a reconnaissance to the summit. My *camarada*, Miranda, was impressed with the importance of an early start, coffee was ordered for six o'clock, and all put in readiness for a quick get-away. About nine on the appointed morning Miranda appeared, but merely to inform me that the mules, "ungrateful beasts without shame," had wandered during the night and therefore we could not start until the morrow! Swearing is utterly futile in such cases. The experienced traveler bows to the inevitable, expresses the hope that the mules will become conscience-stricken and return through the same gate so thoughtfully left open, and busies himself with tasks especially planned for the occasion.

At seven-thirty the next morning we actually started. As our mules swung out on the trail, a flock of parrakeets, startled at their breakfast in the flat tops of the Paraná pines, flew screeching away to the forest, which already rang with the howls of monkeys. Immediately we had passed beyond the deforested slopes, the trail

began to wind in and out of side ravines resplendent in a wealth of edible palms, tree ferns, orchids, and bromeliads, and luxuriantly draped with vines and creepers in wildest abandon. All thought of the mire underfoot or the hardness of my mount was forgotten. I even forgot that I wanted to wring Miranda's neck, and gave myself over completely to enjoyment.

With many a meander, but ever upward, climbed the trail. At 3600 feet it crossed the roaring Campo Bello (here called Rio Maromba) on a rickety old wooden bridge that sooner or later will hurl somone to certain destruction on the rocks below. Bending sharply back upon itself, the trail surmounted, by several switchbacks, another bracken slope, marking the site of an old burn, and then, at about 5000 feet, plunged us into the clouds. We continued through a ghost world of dimly outlined giant trees, hung with sinuous lianas and burdened with great rosettes of bromeliads, where every leaf was dripping. All about was only mist, underfoot only mud. As we rode along, we were swept by the long, gracefully drooping tips of a beautiful species of bamboo, and soaked to the skin.

At 6000 feet we rode into a little clearing and, to our astonishment, found ourselves in a laden apple orchard. It had been planted years ago by the old Viscount who then owned the mountain, and was still bearing nobly, though its days were numbered. The altitude was just right for the production of fine fruit, but in this land of mists the trees must surely succumb to their burdens of



Photograph by Robert Donati

THE TARTARUGA

The dwellers on the mountain call this huge rock "the turtle" because of its fancied resemblance to that reptile

Photograph by Robert Donati

A LAKELET AT 7800 FEET ELEVATION
This view is toward the south from near the base of the final peaks

moss. A mud-and-wattle cabin, erected to shelter trail workers, stood in the clearing, so we dismounted there to eat our lunch—with fresh apple-sauce for dessert!

The orchard marked the upper limit of the subtropical zone and the heavy forest which is coincident with it. Above, the trail emerged upon the open *campos* (literally, fields) of the temperate zone. Before us rolled away ridge after ridge, some blotched with dark patches of stunted forest, others covered only with grass and flowers, while, towering above them all, great broken peaks of naked rock reared skyward. To pass from the gloom of dense, dank forest into the light and freedom of these elevated flower gardens was like a sudden transition to another planet.

I rode on in a trance until, rounding the shoulder of a grassy knoll, we came face to face with the highest human habitation in Brazil. Paradoxically, it was a structure of but a single story—the home of the government meteorological observer. The white posts, poles, and chicken coops of an orthodox weather station stood just to one side, at an elevation of about 7200 feet above the sea. Small though the house was, we were given shelter for the night, and later I lived here during the rainy weeks spent in studying the bird-life of the heights.

And rainy indeed is the climate of Alto Itatiaya, as the upper levels are called. The mean precipitation, registered by the official gauge, is more than ninety inches a year. As for temperature, Alto Itatiaya holds the record for the lowest mean, maximum, and minimum of the whole country. These are 52.7, 73.6, and 21.2 degrees Fahrenheit, respectively.

The morning following our arrival at Alto Itatiaya dawned crystal clear, and as soon as we could swallow some bread and coffee we were off afoot to scale the

peak. A league lay between the house and the base of the last crags, but we gave no thought to distance as we swung across a wide grassy slope toward the valley of the upper Rio Campo Bello.

Upon the threshold we stopped, appalled, for we seemed about to enter a region whence all life had fled. Mountain valleys above timber line were not strange to me, but never before had I looked upon such a scene of absolute desolation. On every hand only barren rock greeted the eye, and the naked bowlders strewn in chaotic piles and ridges everywhere over the broken surface of the basin suggested the ruins of a vast amphitheater whose stone columns and benches had been shattered by some cataclysmic force. Forest there was not, unless one would consider the wretched little dwarf trees struggling upward along the stream.

At length, when we had eyes for less majestic things near at hand, the oppressing sense of desolation vanished. For there, among those same forbidding stones, flourished countless flowers of every hue. A red *Amaryllis* stood up bravely between the bowlders, in striking contrast to a rich purple *Utricularia* that hid among the tall grasses; an *Alophia* of palest blue preferred the wetter spots; scarlet and yellow "toucan's beak" (*Syphocampylos*) thrived in stony soil beside the trail; and at a lower level behind us one entire slope was ablaze with the purple blossoms of a low shrubby *Chætostoma*. But most striking of all were the compound umbels of a peculiar white-flowered plant, the *Pæpalanthus polyanthus*. There were whole fields of it. A little farther along, a mass of the largest begonias I had ever seen grew in a cranny in the rock itself. Then the trail passed through a meadow that was a single mass of daisies. And I have heard it said that Brazil has no wild flow-

ON THE CLIMB TO THE SUMMIT
The plants growing in the crevices of this slope are *Chusquea*, a species of bamboo dwarfed to a height of about 18 inches

ers! Even the high mountain meadows of California could scarce rival these rocky *campos* in the splendor of their efflorescence.

And there were animate flowers too. The sweet liquid notes of the white-capped tanager floated out from a stunted copse with a clearness that was startling. Even the humming-birds were trying to sing, and in the stillness of the heights the volume of noise produced by a tiny plover-crest was out of all proportion to the diminutive bird. And here had wandered the common dooryard sparrow, the *tico-tico* so dear to the hearts of Brazilians. But in such a setting its cherry song seemed strangely out of place.

From the Vargem das Flores the trail crossed the "Little River of the Flowers" (the translated name for the highest reach of the Rio Campo Bello), climbed over a bowlder-strewn slope where hopped thousands of tiny toads with bellies as red as the *Amaryllis* we had just passed, and lost itself in a wild jumble of talus at the western base of the culminating peak. As I stared up at the formidable wall towering 1200 feet above us, I was struck by the appropriateness of its old Tupi name, Itatiayassú (Grand Itatiaya), and by the utter misnomer of Agulhas Negras (Black Needles), applied by the Brazilians. The massif of gray nephelene-syenite is not black, nor does it bear any semblance to needles. A narrow dentate ridge, it may be likened more truly to a cutlass with its upturned edge badly nicked by the neck vertebræ of sundry pirates.

To attain the summit seemed impossible, for the last 600 feet of naked rock were vertical. But Miranda knew the only route, and at length we scrambled up from the dusk of a deep fissure into the light at the top of the highest pinnacle. A sea of mountains rolled away in every direction, but heavy clouds prevented any view of the more distant landscape except where tiny patches of sunlight had managed to break through. The lovely spots of *campo* or forest thus exposed were sufficient guaranty that under clear skies the view is superb. This day, however, the summit was not a place to tarry. Rain drops were beginning to splash upon the rocks, and we were both cold and hungry. A humming-bird whizzing by like a bullet seemed possessed of true wisdom, and we followed it to lower levels.

A Brazilian writer has said, "In truth, shins of steel, lungs of bronze, and a heart of iron are needed to climb Itatiaya, whose ascension is agonizing, terrific, and full of the most painful difficulties." The ascent of the peak by an American botanist of seventy and his wife of sixty-five rather discounts such a statement, though the fact that no one had succeeded in reaching the highest point until September 8, 1911, suggests the old truism that it's all in knowing how. Nevertheless, the visitors' book kept by the weather observer shows that surprisingly few have climbed the peak since the way has been known.

The mountain is easily accessible from Rio de Janeiro, and the traveler who fails to include Itatiaya in his itinerary will miss a scenic wonder that ranks with the Falls of Iguassú as one of the greatest in all Brazil.

INSPIRATION

The Story Back of Lincoln Ellsworth's Polar Achievements

By HAROLD T. CLARK
Secretary, the Cleveland Museum of Natural History

On May 29, 1928, the Congress of the United States voted to award a special Gold Medal, now in the course of preparation, to Lincoln Ellsworth, a Trustee of the American Museum of Natural History, for his participation with Roald Amundsen in the airplane flight of 1925 and the flight of the dirigible "Norge" in 1926. How Mr. Ellsworth's ambition took shape and crystallized into history, to make as part of his own life experiences an attempt to solve the mysteries of the northern wastes—mysteries that had also lured Peary and Amundsen and other gallant men to pit human endurance, courage, and enthusiasm against the odds of Nature—is told but briefly in the following tribute to the man whom his country has seen fit to honor.—THE EDITORS.

HOW many of us really appreciate the tremendous changes that travel by air has wrought in Polar exploration? This question is uppermost as one watches the throngs who pause in the Polar Corridor of the American Museum of Natural History before the case containing memorabilia of the Amundsen-Ellsworth flight by airplane in 1925 and the first crossing of the Polar Sea in the dirigible "Norge" in 1926, and sees them glance hastily first at the near-by sledge which took Peary to the North Pole in 1909—the crowing achievement of twenty-eight years of endeavor—and then at the one used by Amundsen in his remarkable journey to the South Pole in 1911.

The amazing recent flights of Commander Richard E. Byrd and of Sir Hubert Wilkins in both the Arctic and Antarctic, make it easy to forget that less than five years ago such a method of exploration was regarded as foolhardy. It was the airplane flight by Amundsen and Ellsworth in 1925, when they reached a point only one hundred and twenty nautical miles distant from the North Pole, that prepared the way for later flights, and in his book *Skyward*, Commander Byrd, with characteristic generosity, has emphasized the enduring importance of the flight of the Norge, as follows:

> The epochal flight of the Norge across the north polar regions did much to wipe out some of the skepticism created by disasters among dirigibles. . . . It is already apparent that the flight has had a profound and beneficial effect upon aviation in the lighter-than-air field, but when we think that plus that demonstration of the great value of aircraft, those hardy pioneers have performed a tremendous service in exploration, we must conclude that those men have accomplished one of the great feats of our age which will shine through future ages as the feats of Columbus, the Cabots, Magellan, and other great navigators of the past, shine through our age.

Fitting it is, therefore, that our Congress should recognize in a very special way the epoch-making character of the flights of 1925 and 1926.

Few there are who realize how important a part in revolutionizing the methods of Polar exploration was played by those very sledges of Peary and Amundsen on display in the American Museum. The story is worth telling both for its own sake and as an indication of how far-reaching the inspiration of a great Museum may be.

As a boy, Lincoln Ellsworth was fascinated by stories of the Arctic. Of a thoughtful nature but with an active imagination, he was thrilled by accounts of men willing to endure physical hardships that they might push further back the barriers to human knowledge. Although Ellsworth was a rather frail child, the desire to achieve physically became the ruling ambition of his life, so much so, that it amounted almost to an obsession. There fell into his hands a copy of Theodore Roosevelt's *Ranch Life and the Hunting Trail.* This account of outdoor life made a great appeal, and when he learned that Roosevelt had been able to fashion a body naturally weak into a fit instrument "to seek, to strive and not to yield," he determined to do the same.

By the time he reached school and college he had made good progress along this line and had become a long-distance runner and oarsman of recognized ability. While a student at the Columbia School of Mines, Ellsworth haunted the American Museum, studying the exhibits relating to the Arctic.

"I feel quite certain," said Ellsworth in an address before the Museum in 1927, "that the American Museum is unaware of just how deeply I feel its debtor, for here, in this very Museum, came my first urge to want to go into the Arctic. The vividly colored allegorical paintings in the

Museum halls—scenes from the far-away shores of the Polar Sea—stirred my imagination. A gaunt land. A waste of cold and storm. What was the attraction, wherein the fascination? Just why or how would be difficult to explain. While one cannot always dissect a taste or a passion, these filled me with dreams that would not let me be. There, too, were the sledges that had reached the North and South poles. How it thrilled me to trace their journeys on the relief maps on the walls above them, stage by stage until the goal was reached—a goal that had acted as the motive-force to produce some of the most wonderful journeys in the face of terrible conditions, in the history of our race."

ROALD AMUNDSEN AND LINCOLN ELLSWORTH
Photograph taken at Nome, Alaska, May 15, 1926

Since, at the close of his college course in 1903, there did not appear any opportunity to go at once to his chosen field, Ellsworth decided to join as an axeman the second survey party to be sent out by the Grand Trunk Pacific, to explore a new route through Canada. During the succeeding five years he remained in the employ of this company, rising to the positions of chainman, rodman, leveler, transitman, and finally at Prince Rupert, the Pacific terminal, he held the position of resident engineer in charge of a party.

During the next four years Ellsworth alternated between working as an engineer in Pennsylvania and Alaska and exploring many out-of-the-way places. To use his own words—"Because my great-grandparents were among the first white settlers on the Western Reserve of Ohio, from them I must have inherited my love of the open frontier—the outskirts of civilization. Among the hunters, trappers, scouts, and 'two-gun men' of the early American West are to be found my boyhood heroes. They were all brave and fearless men, and as long as I live they will ride their phantom horses across my memory. Today only a few are left. The rest have gone west—to the eternal west beyond the setting sun. I have known many of them. I have done most of the things that the boy of a generation ago dreamed of doing; I have hunted buffalo, lived among the Indians, prospected for gold, and dragged the surveyor's chain across the unmarked western prairies—things I always wanted to do."

All this frontier training developed not only a fine physique but the ability to respond quickly to any emergency. Ellsworth's courageous act on the 1925 expedition, in saving Dietrichsen and Omdal from drowning, when, heavily laden, they broke through newly formed ice—an act which Amundsen publicly declared saved the entire expedition—was made possible only by these long years of quiet preparation.

In 1912 through the American Museum of Natural History, Ellsworth met George Borup, who with Donald B. MacMillan was planning an expedition in search of Crocker Land in the Arctic. From among a long list of applicants Ellsworth was selected by Borup as one of his companions. Borup's tragic death while trying to rescue a friend from drowning ended this project.

Determined to take up Arctic exploration as his life-work, Ellsworth went to London and there spent a winter in the study of practical astronomy and surveying at the school of the Royal Geographic Society.

Upon his return to America in 1913, seeing no immediate opportunity to go to the Arctic, he obtained a position as field assistant with the United States Biological Survey because of his love of nature and wild-life. Liking to climb mountains, he specialized in the distribution and

habits of the wild sheep of America, tramping and hunting in the Rocky Mountains from the Gulf of California to the Yukon Boundary.

In 1917 appeared Peary's *Secrets of Polar Travel*, in which he suggested that airplanes might be used for Arctic exploration. Ellsworth immediately sought out Peary and endeavored to interest him in trying out such a plan. Peary had succeeded in his great quest for the North Pole and felt that such an attempt should be left to some one else. Ellsworth tried to interest others but without success. The attention of the world was then centered on the war in Europe and the times were unpropitious for the organization of any expedition.

Shortly thereafter and before the entrance of the United States into the World War, Ellsworth joined the Ambulance Service and sailed for France. He tried to join the Lafayette Esquadrille but was declined because of being several years beyond the age limit for pilots.

While in Paris, he received an urgent letter from Dr. Henry Fairfield Osborn, who was familiar with Ellsworth's hopes, saying that he had just lunched with Amundsen and that Amundsen was going to "steal his thunder," as he was planning to fly across the Arctic. Amundsen had been working quietly upon this idea for about eight years. In *My Life as an Explorer*, pages 103 and 131, he outlines his different efforts dating as far back as 1909.

Shortly after this, Amundsen went to Paris. Ellsworth met him and asked to join the "Maud," but the personnel was already complete.

Soon thereafter the United States entered the war. Ellsworth enlisted in the Aviation Service as an observer, and, although over the age limit, learned to pilot.

A serious attack of influenza then laid him low and virtually incapacitated him for several years after the war. During this time, however, he clung to the determination to explore the Arctic by air, following closely the unsuccessful effort by Amundsen to fly from Alaska to Spitzbergen in 1923.

Amundsen's bankruptcy, made necessary by his having been too trusting in his dealings with others, kept him busy in Norway during most of 1924. Since no opportunity to go to the Arctic appeared, Ellsworth become a co-leader with Dr. Joseph T. Singewald, Jr., of an expedition to Peru for Johns Hopkins University, to make a measured geologic cross section of the Andes. This was so successful that he planned to go again and he had even purchased his tickets, when he saw in a newspaper that Amundsen was in New York at the Waldorf-Astoria Hotel. Without the loss of a minute Ellsworth drove there.

In *My Life as an Explorer*, page 119, Amundsen has described his discouraged state of mind at this very moment. His lecture tour had proven almost a failure, and his future seemed a blank. "I was nearer to black despair than ever before in my fifty-four years of life." A ring of the telephone, a brief exchange of words, an invitation by Amundsen to Ellsworth to come to his room, and within a few minutes they had decided to join forces. That decision changed the course of all future Arctic exploration, and made possible a contribution to man's knowledge of the unknown polar seas that has proved epochal in the history of the world.

"AIR PIONEERING IN THE ARCTIC"[1]

The Two Polar Flights of Amundsen and Ellsworth 1925 and 1926

MANY a drama has been played out on the Arctic ice, and many an heroic story has been written of the adventures and trials upon that frozen desert. Yet rarely has there been a more dramatic story than that of the Amundsen-Ellsworth Flight of 1925, and never has there been a more successful expedition than the epoch-making crossing of the Polar Sea in the dirigible "Norge," in 1926.

The stories of these two flights have been told in many forms. Even the most casual of newspaper readers knows the major facts, yet so extraordinary were the happenings that took place on those two expeditions that even the smallest details bear with them an interest comparable to the major facts.

Because of this, this handsome volume of the National Americana Society has a double value. To the reader interested only in the drama of these two amazing flights, the book is fascinating. To the student interested in the details of Arctic exploration by air, the volume is invaluable. No more gripping account of adventurous exploration was ever set down, and no record ever made of man's struggle to overcome the Arctic was ever more meticulously complete.

Divided into two major portions descriptive, firstly, of the 1925 flight, and secondly of the flight of the Norge the following summer, the volume is beautifully and completely illustrated with scores of remarkable photographs, with photostats and maps and reproductions of newspaper accounts. Finally, and properly, the book contains a sincere tribute to Roald Amundsen written by Lincoln Ellsworth, whose friendship and assistance made possible the final accomplishments of one of the greatest explorers who ever entered the ice-bound regions of the north.

Great were the flights of which this volume tells. Great is the record that has been made of them. No individual interested in mankind's struggle with the frozen north should fail to read this volume through. No library that desires to possess complete records of the Arctic can afford to be without this magnificent account.

[1]Published by the National Americana Society, New York, 1929.

CONTRIBUTORS TO THIS ISSUE

The Cover of NATURAL HISTORY

Arthur A. Jansson has depicted the critical moment of a tiger hunt in his painting "Ringing the Tiger," on the cover of this issue of NATURAL HISTORY. The tiger, surrounded by his pursuers, finds himself trapped, and is nerving himself for one last dash for liberty. The tiger is of the short-haired species found in southern Asia.

William J. Morden, author of "Tiger Hunting in Nepal" has appeared before in NATURAL HISTORY. As leader of the Morden-Clark Central Asiatic Expedition, Mr. Morden collected *Ovis poli* in the Russian Pamirs, hunted ibex in the Thian Shan, and, with Mr. James L. Clark, was captured and tortured by the Mongols in the Gobi Desert. The complete account of this extraordinary expedition appears in Mr. Morden's book, *Across Asia's Snows and Deserts*, and an account of the *Ovis poli* hunt entitled "Marco Polo's Sheep" appeared in NATURAL HISTORY for September–October, 1928. Mr. Morden has also spent much time in Africa and India. He sailed July 16 to lead the Morden-Graves North Asiatic Expedition which, among other things, hopes to collect the long-haired tiger of the Amur River Valley in Eastern Siberia.

Frank M. Chapman, curator-in-chief of the American Museum's division of zoology and zoogeography, went to Barro Colorado Island, in the Canal Zone, to make studies for the habitat group of tropical birds now on exhibition in the American Museum; but he found there such an unusual opportunity to observe both birds and mammals that he returned to the island four successive seasons. The principal results of this additional field work appears in his monograph of the Oropendolas, or giant orioles, published by the Museum in its *Bulletin* (Vol. LVIII, 1928, pp. 123–166). Incidentally he has gathered enough material to form a book, which will appear in the fall, on the life of the island. The "Conquest of Claudia" is from this forthcoming work.

In 1921 **Ernest G. Holt** of the Carnegie Institute was assigned by the American Museum of Natural History to make an ornithological survey of the Serra do Itatiaya, in Brazil, and it was while engaged in this undertaking that he had the opportunity to photograph and record the scenic wonders that are the subject of his article in this issue, entitled "Itatiaya, Brazil's Most Famous Mountain."

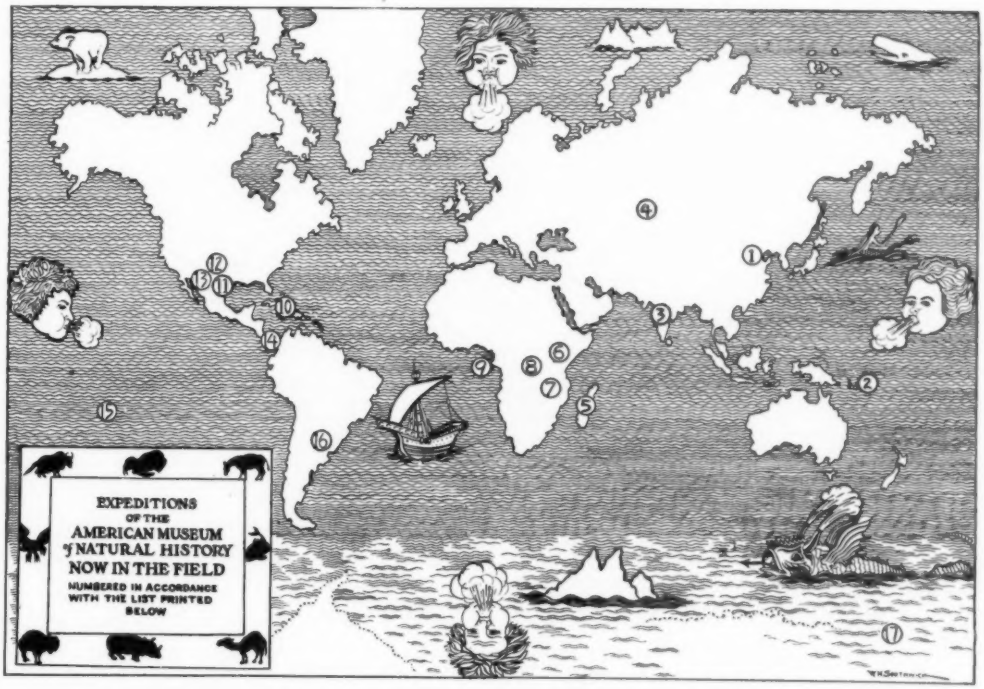
Herbert F. Schwarz, author of "Honey Wasps," has been a frequent contributor to NATURAL HISTORY on the subject of bees, to which particular division of insect life he has devoted much study. Upon Mr. Schwarz's retirement from the editorship of NATURAL HISTORY in 1925, he undertook the editorship of the publications of the New York Academy of Sciences, in addition to continuing his scientific studies as research associate in Hymenoptera at the American Museum.

Each summer, for some years past, **W. R. Leigh** has visited America's southwest to paint studies of that colorful section of the United States. This work proved excellent preparation for painting African landscapes when he was selected as one of the two artists to accompany the Eastman-Pomeroy-Akeley 1926 African Expedition—as the coloring of Africa is very similar to our southwestern country. It was while on the Eastman-Pomeroy-Akeley African Expedition that the adventure described in "A Night with an African Herder" took place.

"The Black Art," by **Mrs. Margery Loeb**, of the American Museum's department of anthropology, gives but a slight idea of the breadth and earnestness of her studies of mythology, particularly that of the North American Indian, which is to be the theme of her doctoral thesis. In her work at the American Museum she plans and assembles the educational exhibits on anthropology that are lent to schools in New York City. At the present time Mrs. Loeb is making a detailed study of artifacts found in association with the Aleutian mummies that were brought to the Museum by the Stoll-McCracken Expedition of 1928.

The author of "Falconing," **George G. Goodwin**, is primarily a mammalogist, and holds the position of assistant curator of mammals of the world, in the American Museum, but he has devoted much of his spare time to the art of falconry, both in Europe and in America. He is never so happy as when on the moors with one of his high-flying falcons wheeling three steeples high overhead.

"Falconry," says Mr. Goodwin, "is the finest and most humane sport of its kind, for it not only gives the game a sporting chance to get away from a natural enemy, but there is no such thing as a maimed bird lost and left to die. The quarry is either killed instantly or escapes unhurt."



1. Central Asiatic; 2. Whitney South Sea, Solomon Islands, for birds; 3. Vernay-Faunthorpe for Asiatic mammals; 4. Morden-Graves, Turkestan, for mammals; 5. Madagascar, for birds, mammals, and fossils; 6. Sanford-Legendre, Abyssinia, for mammals and birds; 7. Columbia University-American Museum, to Africa for anatomical study; Straus, Nyasaland for birds; 8. Tanganyika for birds and mammals; 9. Thorne-Correia, Gulf of Guinea, for birds; 10. DeSola, Cuba, for reptiles; 11. Whitney-Olson, Texas, archæological survey; 12. Whitney-Snodgrass, Folsom, New Mexico, archæological survey; 13. Frick-Rak, Sante Fé, for fossils; Bernheimer, Cañon del Muerto, pictograph study; Ogden mills, Cañon del Muerto, archæological survey; 14. Benson, East Panama, for birds; Blick, Honduras, for fossils; 15. Shapiro, Polynesia physical anthropology; 16. Naumburg-Kampfer, Southeastern Brazil, for birds; 17. Byrd, Antarctic

IN THE FIELD OF NATURAL HISTORY

Expeditions — Scientific Research — Conservation
Books — Meetings of Societies

EDITED BY A. KATHERINE BERGER

EXPEDITIONS

THE Columbia University-American Museum Expedition to Africa, which is being sent from the department of anatomy of the College of Physicians and Surgeons of Columbia University and from the department of comparative anatomy of the American Museum of Natural History, will be the only expedition ever sent out for the purpose of securing entire, well preserved adult gorillas of all known varieties exclusively for anatomical study; together with similar specimens of chimpanzees and other African primates. It will also make special studies and photographs of the feet of unshod natives, unspoiled by civilized shoes. This material is desired by Dr. Dudley J. Morton of the College of Physicians and Surgeons, who has taken a prominent part in organizing the expedition and who expects to use this information in his studies on the evolution of the human foot and on its postural disorders.

The expedition plans to spend about six months in its journey across Africa from east to west. It is under the leadership of Mr. Henry C. Raven, associate curator of comparative anatomy in the American Museum of Natural History, who is well known for his previous explorations for the National and American Museums, in Borneo, Celebes, Africa, Australia, and Greenland. The other members of the expedition will be Dr. William K. Gregory, professor of vertebrate palæontology, Columbia University, and curator of the department of comparative anatomy of the American Museum of Natural History, Dr. J. H. McGregor, professor of zoology, Columbia University, and Dr. E. T. Engle,

associate professor of anatomy, College of Physicians and Surgeons, Columbia University.

The expedition expects also to visit the grave of Carl Akeley, who lies buried on the slopes of the beautiful Mt. Mikeno in the Parc National Albert, east of the Belgian Congo. Largely as a result of Akeley's efforts to secure protection for the fast-vanishing gorilla, King Albert and the Belgian Government set apart this district to be a perpetual sanctuary for wild life. The expedition hopes to be able to study and photograph the living gorillas in this sanctuary and to secure its anatomical specimens in other regions outside of the Parc. In the Gaboon region of French West Africa it will study and collect the West African gorilla made famous by Du Chaillu.

As NATURAL HISTORY goes to press, word of the expedition comes in a letter from Doctor Gregory to Professor Osborn. He says in part:

"At last we can report success in obtaining the necessary permits from the Belgian government after a period of doubt and anxiety. Baron de Cartier de Marchienne received us most kindly in London, but we found that Akeley had made him so rock-ribbed a conservationist that he was extremely loath to cede any gorillas to us, even outside the Parc National Albert. Dr. J. M. Derscheid of Brussels, however, to whom the Baron referred us, felt that in view of the importance of our plan to secure a record of the anatomy of the mountain gorilla, it would be well for the government to assist us in every way. Consequently he secured all necessary documents and permits, orders to game warden, etc., together with invaluable advice gained from his own experience in studying the gorilla on the Akeley-Derscheid expedition.

THE Morden-Graves North Asiatic Expedition is now somewhere in the Soviet territory. The personnel of the expedition comprises William J. Morden, leader, field associate in mammology on the scientific staff of the American Museum; Mr. George C. Graves, II, and Mr. George G. Goodwin, assistant curator, department of mammals, on the staff of the Museum. The expedition is being financed by Mr. Graves.

The primary objects are the collection of an exhibition group of the long-haired Siberian tiger of the Amur River region, and of the saiga antelope in Russian Central Asia. In addition to these a general collection of fauna of the regions visited will be made.

Mr. Morden and Mr. Goodwin left New York in July and will go first to Leningrad and Moscow, and from there into the district of Russian Central Asia, where the few remaining saiga antelope are said to range. They expect to spend the months of September and October in Central Asia. After the completion of the work in that district, they will trek across to the Trans-Siberian Railroad and travel by it eastward to Vladivostok. Mr. Graves will cross the Pacific and join Mr. Morden and Mr. Goodwin in Vladivostok about the first of November, after which the three will proceed northward to Khabarovsk and endeavor to obtain the necessary specimens of the tiger in the little-known region northwest of that city.

Last fall Mr. Morden made a special trip to Moscow and Leningrad to make the very necessary contacts and obtain assurances that when he brought an expedition to Soviet territory, every facility would be accorded him. On his return he reported that he had been extremely well received and had been assured that all possible assistance would be given him. Mr. Morden was previously known to the Soviet Government, for in 1926 he was the leader of the Morden-Clark Asiatic Expedition, which made an excellent collection of *Ovis poli* in the Russian Pamirs, and ibex and roe-deer in the Thian Shan Mountains, and crossed Central Asia to the Trans-Siberian Railroad.

Owing to the fact that the tigers must be hunted in the winter time when they are in their best pelage and when there is sufficient snow to enable the hunters to track them, the expedition has been equipped for very cold weather. Much of the work will be done on snowshoes and skiis, and for a considerable portion of the time the party will probably be out of touch with the outside world. The expedition expects to return in March or April of next year.

THE anthropology department will have expeditions this summer to Mexico, Santo Domingo, Arizona, the Folsom district in New Mexico, Texas, the Montezuma Creek region in Utah, the Andean region, and Polynesia.

THE return to New York of the Tyler Duida Expedition, with large collections of the fauna, flora, and rocks, from the sides and summit of Mt. Duida, coupled with the collections gathered by the Lee Garnett Day Expedition sent last year by the American Museum to Mt. Roraima, furnishes material, it is believed, sufficient for very definite conclusions to be reached concerning biological distribution in the very interesting and little explored mountainous region lying between and parallel with the courses of the Rivers Amazon and Orinoco.

The personnel of the expedition included Mr. S. F. Tyler, Jr., who is at present traveling in

search of more adventure up the River Orinoco, and through whose generosity the trip was prosecuted; Mr. G. H. H. Tate, leader; Mr. Charles B. Hitchcock; geologist and cartographer; and Mr. R. S. Deck, ornithologist.

Mt. Duida is a principal feature in a vast, isolated, and hitherto unexplored region; it is a tableland varying in elevation from 4000 to 7000 feet above sea level, with an area of about 300 square miles, and stands in the extreme south of Venezuela, a few miles from the parting of the Casiquiare Canal from the Orinoco.

Mt. Duida's existence has long been known. Humboldt, the explorer and geographer, spoke of it as "the granite group of Duida"; but it remained for Sir Robert Schomburgk to divine that its formation is sedimentary—sandstone.

The tableland is roughly foursquare, bounded not by sheer walls of rock like Mt. Roraima, but by bold, steep slopes, in part steplike, banded with narrow, horizontal stripes of precipice, and elsewhere jutting out as promontories or receding into walled-in valleys that seem most effectively to bar any ascent to the plateau.

A way was discovered, however, up the steep slopes of one of the headlands, and with the assistance of local Indians—Maquiritares—suitable trails were cut, not only for the slopes, but all over the top of the mountain. On the actual ascent more than 150 ladders of various sizes were required. These were built with saplings and lashed with "sipos" brought from the forest below. As the work of trail construction progressed, camps were formed in all places of distinctive environmental conditions, in order that, later, collections completely representative of the Duida region might be secured.

Three months were passed on the top of Duida, which was found composed of great, undulating, parallel ridges and valleys, and clothed with a covering of woods and brush so dense and matted as to be practically impenetrable except for a native armed with a macheté. Collecting was prosecuted from eight stations, efforts being made to gather exhaustive material, not only of the birds and mammals, but of all zoological and botanical groups, since it was felt that an opportunity such as this for sustained and intensive collecting in such an inaccessible region as the Mt. Duida plateau was unlikely to occur again for many years. Besides, the knowledge that a very high percentage of even the commonest plants or animals would prove to be new to science, gave an added stimulus to the collectors.

The highest station was approximately 7000 feet above sea level, and placed close to the top of the next to highest point of Mt. Duida (the highest is only a few hundred feet higher, but a number of miles away). From this vantage point magnificent views were afforded by relatively near-by mountains to the north and northeast, and farther away to the east and south by the Parima Range, and its offshoots. Westward appears only peneplained country some 300 feet above sea level, broken by a few low, relatively unimportant hills. The bearings of all visible features were carefully taken by means of planetable and alidade with a view to subsequent revision of extant maps, and planetable maps were drawn of Mt. Duida itself and of the territory in the immediate vicinity. At the center of the plateau a change in the geology with consequent reflections in the vegetation and zoology, was remarked, the significance of which has yet to be surely determined.

The expedition left New York for Mt. Duida by way of Para last July. Regrettably, two of its members, Mr. Tyler and Mr. R. S. Deck, were forced by ill health to return home before completion of the time planned upon; nevertheless, the information and collections obtained by the remaining members and their helpers are far in excess of what they themselves had foreseen.

The dried plant collection includes about 500 species, a very large proportion of which, coming from the summit of an unexplored mountain, should prove to be undescribed.

Dr. H. A. Gleason, of the New York Botanical Gardens, who identified the plants collected by the Lee Garnett Day Expedition to Mt. Roraima (1926–7), has undertaken to work upon the material from Mount Duida.

This collection of plants, will be donated to the New York Botanical Gardens, as has been done on previous occasions; however a named second set of specimens will be kept at the American Museum for some time to come for purposes of reference.

On June 3, President Osborn on behalf of the Trustees of the American Museum gave a luncheon to the returned members of the Tyler Duida Expedition and to representatives of the Museum departments concerned with this expedition. Among the guests were Dr. Isaiah Bowman of the American Geographical Society, Mr. Lee Garnett Day, patron of the Museum's expedition to Mt. Roraima in 1928, and Mr. H. A. Gleason of the New York Botanical Gardens. The geographical, botanical, and zoological significance of the expedition was discussed by Doctor Bowman, Mr. Gleason, and Dr. Frank M. Chapman respectively. Mr. Tyler, having already returned to the Orinoco for further exploration, could not be present.

THE American Museum has just received from the Sanford-Legendre Expedition, now collecting in Abyssinia, a beautiful series of specimens of the mountain bushbuck, or nyala. The best specimens from this lot will be incorporated in a group for the Akeley Memorial Hall.

The largest head in the set has a symmetrical pair of horns measuring forty inches along the outer curve, twenty-five inches from base to tip in a straight line, and twenty inches from tip to tip. This is the fourth largest head ever recorded.

Among other specimens received in this first shipment are several klipspringers and jackals.

Word from Mr. T. D. Carter, who is a member of the expedition, states that the second shipment of specimens is already well on the way to the Museum. Mr. Carter's plan at the time of writing was to continue from Soddu to Jiren in Jemina Province, thence to Sherada in Kaffa Province, and from there home via the White Nile, arriving in New York the early part of August.

AMATEUR ASTRONOMERS ASSOCIATION

SUMMER classes in elementary and general astronomy will be held under the direction of Mr. Paul Shogren on the second and fourth Wednesdays of each month at 8:00 P.M. at the American Museum of Natural History, outdoors, when weather permits. Other classes will be resumed in the fall.

The first regular fall meeting of the Amateur Astronomers Association will be held on Wednesday evening, September 18, 1929.

GARRETT P. SERVISS

THE widely known writer and lecturer on scientific subjects, Garrett Putnam Serviss has gone, and in his passing the world has lost a great teacher who has during more than forty active years, instructed and inspired many thousands of persons. In this time he has probably done more than any one else in America to popularize the study of astronomy.

Mr. Serviss died in the Englewood Hospital on May 25, 1929. He had made his home in Tenafly, N. J., although for a number of years he had spent the warmer part of each year in France.

Born on March 24, 1851, at Sharon Springs, New York, he was educated at Cornell University, where he was graduated with the degree of B.Sc. in 1872, and at Columbia Law School, where he received the degree of LLB., but he never practiced law.

In 1882, he became night editor of *The New York Sun*, a position which he filled for ten years. During this time he began writing on astronomy, which work continued until within a few weeks of his death. In fact, several of his newspaper articles are being published posthumously.

The early articles by "The Sun's Astronomer," published anonymously, attracted much attention and became a regular feature of his paper. In fact, they impressed the editor of *The Sun*, Mr. Charles A. Dana, so much that he advised Mr. Serviss to make astronomy his life work, a bit of advice which, no doubt, had great weight. At any rate, the interest in the astronomical articles grew until they were syndicated in a great series of American newspapers. By this means alone, doubtless, he reached a wider reading public than any astronomer who has ever lived.

In 1888 he published his first book on his favorite subject, entitled, *Astronomy With an Opera Glass*. This was popular from the start and is still widely used. It was followed by several others, including *Astronomy With the Naked Eye*, *Curiosities of the Sky*, *The Moon*, *Other Worlds*, and *Around the World With the Stars*. He also wrote a number of semi-scientific novels.

Mr. Serviss was the first Honorary Member of the Amateur Astronomers Association and was a frequent attendant at its meetings. On April third last, he was scheduled to give his lecture on "The Poetry of Astronomy" before this society, and there was great disappointment when, on account of illness, this lecture could not be given.

Mr. Serviss spent his life in the joyous service of turning the thoughts of his hearers and readers from the sordid and petty things of this earth to the vast, celestial universe. His passing is a great loss to millions, who looked upon him as a great friend and an inspiring teacher.—CLYDE FISHER.

EDUCATION

THE third season at the Trailside Museum at Bear Mountain is well under way. This educational project, developed and maintained by the department of public education of the American Museum, is being operated in coöperation with the commissioners of the Palisade Interstate Park. Mr. William H. Carr, naturalist in charge of the trail work, is assisted this year by Mrs. Carr, Mr. Joseph Rintelen of Cornell University, and Mr. Samuel Yeaton.

The attendance this season has shown a marked increase. More than 20,000 persons have visited the Nature Trails since the 20th of April. Many special groups from schools have come from New York City and elsewhere to study biology and general nature subjects. Several organizations have sent their leaders to study the nature trail

project. These men remain for one week and are then replaced by others who aid in the building of the trails as they learn how the work is done.

New methods of labeling out-of-door specimens have been developed. The increased number of visitors have made it necessary to construct more permanent exhibits along the trails. The trailside museum will coöperate with Miss Ruby Jolliffe this summer in teaching nature to the thousands of campers who, annually, live in the Park camps. There were more than 100,000 campers, last year, and the field for nature education is indeed a great one.

IN memory of his father, William Lyman Underwood, Mr. William J. Underwood has presented to the education department of the American Museum 1200 lantern slides made from original photographs taken by his father during the many years he was devoted to natural history. Mr. Underwood's delightful book *Wild Brother* is to form the basis of an illustrated lecture for school children, to be prepared by the education department with slides taken from pictures in the book.

CONSERVATION

THAT whales are now in danger of extinction and can only be saved by a concerted international effort for their preservation, is the opinion of Prof. H. F. Osborn, who announces the organization of the Council for the Conservation of Whales by a prominent group of scientists and conservationists.

The Council, which will work toward the preservation of the romantic industry of whaling, as well as that of the whales, numbers among its members Dr. Ray Lyman Wilbur, Secretary of Interior; Gifford Pinchot, former governor of Pennsylvania; David Starr Jordan, president emeritus of Leland Stanford Jr. University; and Prince Nagamichi Kuroda, scientist and member of the royal family of Japan.

An effort will be made to work out a program for treaties between nations and regulations by which the killing of whales may be reduced below the danger point. The movement had been organized under the auspices of the American Society of Mammalogists, of which Dr. Glover M. Allen, of the Museum of Comparative Zoology at Harvard, is president.

ACCORDING to a statement recently coming from the office of the National Association of Audubon Societies, 1974 Broadway, New York City, it generally may not be known that today there are breeding on the lower Texas coast large numbers of the rare and beautiful reddish egret. These birds for twenty years prior to their discovery in 1918 by Dr. T. Gilbert Pearson, had been regarded as practically extinct as breeding birds within the boundaries of the United States. It was while studying bird life on the Texas coast that Doctor Pearson found several thousand reddish egrets breeding on Green Island in Laguna Madre.

This island, which lies about 35 miles north of Point Isabel, affords an ideal nesting place for these birds. It covers about 40 acres and is clothed with a dense and almost impenetrable growth of mesquite and ebony, together with a goodly sprinkling of cactus and yucca. On the tops of this dense growth the birds build their nests. Extensive shoals and mud-flats constitute ideal feeding grounds for the birds, and serve to make the island inaccessible save only to the lightest draught boats.

Shortly after Doctor Pearson's discovery of this marvelous rookery, the General Assembly of Texas, without solicitation, officially leased it to the Audubon Association for a term of 50 years to be administered by it as a bird sanctuary.

THE BASHFORD DEAN MEMORIAL EXHIBIT OF FOSSIL FISHES

THE exhibit of fossil fishes in the southeast pavilion of the fourth floor of the American Museum, a memorial to the late Bashford Dean, first curator of fishes in the American Museum, was opened on the afternoon of June 10, with President Henry Fairfield Osborn presiding. The immediate family and many personal friends of Doctor Dean were present, including a number of his colleagues from the two universities (Columbia and New York) in which he was a professor, and from the two museums, (American Museum of Natural History and Metropolitan Museum of Art) in both of which he was a curator.

President Osborn read a cablegram of greetings from Dr. W. K. Gregory, curator of fishes, who is at present on an expedition to Africa. He then paid a brief tribute to Doctor Dean as his student, colleague, and friend, and asked Miss Francesca La Monte, assistant curator, to unveil the bronze bas-relief tablet by John W. Hope, which is the gift of Doctor Dean's friends from all over the world. Mr. J. T. Nichols, curator of recent fishes, said a few words in explanation of the exhibit, and Dr. E. W. Gudger, bibliographer and associate in the department, gave a brief history of Dean's great work, the *Bibliography of Fishes*, and of its continuation, and of the plan for the publication of a memorial atlas of the valuable unpublished plates, drawn by Doctor Dean himself, portraying the outer development of certain primitive sharks.

Among the noteworthy collections represented in this exhibit are one of Devonian placoderms made by Prof. J. S. Newberry (Doctor Dean's teacher in palæichthyology), the E. D. Cope collection, and the Alfred Ely Day collection from Mt. Lebanon, Syria. These form the basis of the exhibit, which from time to time has been augmented by other specimens.

FISHES

THE American Museum's collection of primitive fishing appliances has been increased by a gift from Gerrit P. Wilder, now in the Cook Islands in the South Pacific. Mr. Wilder not only sends a sample wooden hook but also the native names for each part and wrapping of the implement. Like all primitive workmen, the makers of fishhooks in the Cook Islands take pride in their work and follow precise patterns. This requires that names be given all the important parts and steps in the process. The native islanders fish with large wooden hooks of a special shape, for a curious large fish in the Pacific, known as the ruvettus, or more commonly as the oilfish. The lines are of cocoanut fiber. Ages ago primitive man found that certain fishskins especially the skins of sharks, would polish wood and shell. Mr. Wilders ends an interesting contrivance used by the Cook Islanders to polish their wooden and shell fishhooks. This is a small wooden bow strung with a strip of sharkskin. By grasping the bow in the hand, the native workman can rapidly and effectively stroke the surface to be polished. This method is superior to the usual one of polishing by holding a piece of sharkskin loosely in the hand.

REPTILES AND AMPHIBIANS

THE Brooklyn Museum has deposited its reptile and amphibian study collections in the American Museum. These collections contain much local material of interest and some rare exotic species, among them a fine series of Surinam toads, the remarkable amphibians of the genus, *Pipa*. The females of this genus carry their developing eggs and tadpoles in shallow pockets in their backs. The collection also includes rare turtle skeletons new to the Museum.

In a recent number of the *Bulletin* Dr. G. K. Noble has described, some remarkable tadpoles from East Africa. They hatch from eggs laid in the hollow stems of bamboos, or between leaves of banana trees. They are devoid of both external and internal gills and hence breathe air from the time of hatching. In adaptation to their peculiar habitat, the tadpoles develop a pair of climbing appendages out of the skin and muscles of the throat. Such temporary locomotary organs are unique among the Amphibia. It was interesting to note that in spite of the restrictions of their nursery, the tadpoles retained the distinctive characters of mouth, limbs, and spiracle found in other tadpoles of the same family, Brevicipitidæ. The study gave further support to the view that larval characters may be as important as adult characters in defining relationships.

In the same number of the *Bulletin*, Doctor Noble has described the anatomy of the suction disk on the ventral surface of various Chinese tadpoles. This permits them to cling to rocks in the swift water of mountain torrents. The mechanism was apparently evolved from an unspecialized integument and ventral musculature such as is found in our common pond polliwogs.

EXPERIMENTAL BIOLOGY

A LARGE series of eel-like amphibian *Siren* was recently brought from Florida by Mr. William G. Hassler. No less than 67 adults and 250 very young ones were brought back alive for investigating the problem of metamorphosis in this form. Incidentally, 11 large *Amphiumas*, or snakelike amphibians, and several snakes new to the collections of the American Museum were obtained, and a large series of other species. The more striking will be mounted by the new infiltration method recently perfected in the department.

MEETINGS OF SOCIETIES

THE twenty-fourth annual meeting of the American Association of Museums convened in Philadelphia, May 22–24, with headquarters at the Bellevue-Stratford. The time and place of this meeting was arranged to coincide with the twentieth annual meeting of the American Federation of Arts, so that joint sessions could be held. The American Museum was represented by Director Sherwood and members of the department of education.

SCIENCE OF MAN

UPPER Pliocene Man in East Anglia.—Through the discoveries of J. Reid Moir of Ipswich, England, and the writings of Sir Ray Lankester and Professor Osborn, the Upper Pliocene man of the Red Crag of England is now well known and well established. The Red Crag marks one of the final stages of Pliocene time in which, for the last time, appear two types of mastodonts and an early type of the elephant family known as *Archidiskodon planifrons*. Now Reid Moir comes forward with a new discovery of traces of man more ancient than those of the

Red Crag—namely, two flint implements of human manufacture, a "sling-stone" and a "flint scraper" found *below the Red Crag* near Ipswich, England. These implements, remarkable for the relative perfection with which they are fashioned, are described in the British magazine *Man*, April, 1929, pages 62 to 65. The author concludes his description as follows:

> If in this I am right, then it becomes clear that the presence of this object at such an horizon, as a study of the excellence of much of the flaking on the sub-Crag flint implements had led me to believe, points to the fact that man of the Pliocene period had already progressed some distance upon the evolutionary path, as it seems impossible to imagine any ape-like creature producing artifacts such as have now been found in the detritus-bed. The discovery of this "sling-stone" is yet one more reminder that, to judge of the advancement of any prehistoric people merely by the stone implements they made, may be a risky and unsatisfactory procedure.

This appears to be indirect corroboration of Professor Osborn's prophecy that the discovery of the skeleton and brain of Pliocene man will furnish one of the greatest surprises in the whole history of anthropology. In the same connection Professor Osborn is making a very careful restudy of the remains of fossil mammals found associated in the same beds with the Trinil man of Java (*Pithecanthropus*) and the Piltdown beds of Sussex (*Eoanthropus*). If it proves possible to absolutely associate the skull fragments of *Pithecanthropus* and of *Eoanthropus* with the fossilized remains of teeth found in the same beds with them, the geologic age of these two classic forerunners of the human race may be precisely determined. For two years past Professor Osborn has been in correspondence with his colleagues and friends in the British Museum and in Berlin and has finally secured very distinctive fossil teeth associated with *Pithecanthropus* and *Eoanthropus* respectively. At the present moment they appear to give a new and very surprising interpretation of the geologic age of these specimens—namely, that *Pithecanthropus* is geologically much more recent than formerly supposed, whereas *Eoanthropus* is geologically more ancient. In a future note in NATURAL HISTORY Professor Osborn hopes to present these results in a more definite form.

DOWN HOUSE, KENT, ENGLAND
Here Charles Darwin lived for forty years, and here *The Origin of Species* was written

DOWN HOUSE

ON June seventh the home in which Charles Darwin lived and worked from 1842 until his death in 1882, Down House in Kent, was formally opened to the public. For many years there has been an agitation to recover this famous house from the hands of tenants and to establish it as a permanent memorial to Darwin, freely open to visitors. In 1927 it was purchased and presented to the British Association in trust as a public memorial by Mr. G. Buckston Browne, a London surgeon, and since then leading scientists in Great Britain and this country have been diligently working to restore Down House to its original appearance during the forty years of Darwin's residence and to collect the priceless Darwiniana that has been scattered in some instances to the far corners of the earth.

The unceasing efforts of Mr. Browne and others have yielded most gratifying results. To quote from the *London Observer* of May 19:

> The drawing-room has been furnished with a great deal of the original furniture which has been gathered from

various branches of the family. Of all the rooms the most important is what is known as 'the old study.' Here *The Origin of Species* was written; the chair and writing board which Darwin used are standing in the accustomed corner. . . . . Here is his working table brought in great triumph from Cambridge.

Of the many unique and interesting gifts to the collection at Down, one of the most valuable is the presentation by Prof. Henry Fairfield Osborn of the entire series of letters written by Darwin to the great German naturalist, Fritz Müller. These fifty-eight letters were found in the possession of the Müller heirs in Brazil, and after several months of negotiation, Professor Osborn succeeded in purchasing them in time to cable an announcement of the gift to England for the opening.

Another extremely generous gift is the purchase of Sir Charles Hartwell's bust of Darwin for Down House by Dr. Joseph Leidy of Philadelphia. Doctor Leidy attended the opening as the official representative of the American Association for the Advancement of Science. Professor Osborn had hoped to be present also, but at the last moment found that it was impossible to go, and Prof. Edward B. Poulton of Oxford University was chosen to represent him and the American Museum of Natural History.

NEW BOOKS

Holiday Pond. By Edith M. Patch.

IT is always a pleasure to be able to recommend a nature book to the general reader, and we thank Edith M. Patch for again giving us this pleasure by writing *Holiday Pond*, recently published by Macmillan. Doubtless the publishers—possibly even the author—intended this book primarily for children. It is admirably adapted for such readers but adults would do well to borrow it from the nursery in order that Miss Patch may tell them, too, about the interesting things that may be in the pond near their home. Best of all, one is safe in accepting her statements as facts for, unlike certain "popular" writers, she knows her subject. Our only regret is that the book is so short.—F. E. L.

NEW MEMBERS

SINCE the last issue of NATURAL HISTORY, the following persons have been elected members of the American Museum, making the total number 11,182.

Life Members

Mesdames GEORGE D. WIDENER, HARRISON WILLIAMS.
Miss AMELIA ELIZABETH WHITE.
Messrs. JAMES S. OTTENBERG, GEORGE D. WIDENER, JOHN S. WILLIAMS.

Sustaining Members

Mesdames THEODORE S. WATSON, M. W. WELD, MARIE WHITNEY.

Annual Members

Mesdames JACOB GOODFRIEND, ROBERT K. LAMBERT, CAROLINE CLARK MARSHALL, HOWARD T. MARTIN, WOLCOTT SAYRE, WILLIAM R. SIMONDS, CALVIN TOMKINS, KENNETH H. TURNBULL, THEODORE WESTON, F. M. WHITEHOUSE, THROOP M. WILDER, WALTER WOLF, WILLIAM H. WOODIN, JR., THOMAS SEARS YOUNG, WILLIAM HOPKINS YOUNG.
Misses ELIZA DE FOREST DOWNER, LAURIBEL HART, ELINOR L. P. LYON, BARBARA SCHIEFFELIN, CANDACE C. STIMSON, LILLIAN WERBECK, MAY FORSYTH WICKES, MARY RAY WINTERS.
Rev. H. G. MENDENHALL.
Doctors S. T. ORTON, E. MACD. STANTON, WILBUR WARD LESLIE T. WEBSTER, ROBERT H. WILDS.
Col. JULIAN A. BENJAMIN.
Messrs JOHN BARRYMORE, ALBERT R. BRAND, H. ALMON CHAFFEE, DANA C. CLARKE, WILLIAM L. DIXON, EMLEN M. DRAYTON, GEORGE A. GRAHAM, JR., PETER KNOWLTON, MAX KUFELD, FREDERICK W. MORRIS, GURNEE MUNN, ANDREW PETERSON, GEORGE P. ROWELL, LEE SIMONSON, F. L. SMITHE, WM. STURGIS, FRED. W. TIETJEN, THEODORE LANGDON VAN NORDEN, ARTHUR D. WEEKES, F. C. WEEMS, LAWRENCE GRANT WHITE.

Associate Members

Mesdames F. H. BEALE, JOHN B. BIRD, J. THOMPSON BROWN, A. E. BRUSH, H. S. BULLARD, WILLIAM BUTTERWORTH, W. CLEMENT, NELLIE H. COMSTOCK, J. L. DODGE, JAMES H. DOUGLAS, W. L. DOUGLAS, J. A. DREWS, J. W. FIELDHOUSE, WM. M. FITZHUGH, WILLIAM SCOTT GOODFELLOW, A. W. HEWLETT, DANIEL HOWLAND, E. P. JAQUES, HELEN O. KINGSBURY, J. F. KYLER, SHIRAS MORRIS, S. W. MUDD, R. P. PALMER, EDWARD L. PARSONS, PERCIVAL B. ROLFE, M. L. STICKLEY, FRANCES D. TRAFTON, ROBERT S. WALKER, RAY MILLER, CARRIE B. REYNOLDS SUMMERS, FREDERICK M. P. TAYLOR, E. W. VAN VLECK, HENRY G. VAUGHAN, JAY W. VAUGHAN, R. WERNIGK, A. ROBINSON WHEELWRIGHT, GRACE WRIGHT.
Misses M. ELIZABETH BELLINGER, LAURA BOORMAN, KATHARINE BRANDEGEE, KATE H. GOODBODY, CAROLINE E. HAMILTON, MARGARET ELIZABETH HECHT, MARY S. HOLBROOK, E. R. HOOKER, MARY L. HOWARD, BETH KIRK, EMMA MARBURG, HARRIET W. MITCHELL, MARY E. MYERS, LINA M. PHIPPS, EDITH SCAMMAN, ELIZABETH SESSIONS, FRANCES A. SPRAGUE, SUSAN H. WEBSTER, MARGARET WHITING, PRISCILLA B. WHITTEMORE.
Reverends JOHN U. HARRIS, CHARLES WOOD.
Doctors C. AMIRTHALINGAN, W. R. BARNEY, WILLIAM H. H. BRIGGS, JOS. B. DELEE, GLENN SCOTT DILLÉ, MARTIN EDWARDS, IGNACIO GONZÁLEZ GUZMÁN, JULIUS A. KAPLAN, GEORGE A. MACCALLUM, DAVID C. MORTON, A. R. SHEARER, HARRY R. SLACK, JR., CHARLES D. SNELLER, C. J. STOVER, WM. H. STRIETMANN, A. W. VALENTINE.
Major A. WILLIS ROBERTSON
Col. FRED S. FOLTZ
Lieut-Colonel PH. J. LAUBER
Judge CHAS. H. ROBB
Messrs HARRY W. ADAMS, JAMES P. ALEXANDER, D. J. ALLEN, J. O. AMOS, O. F. ANDERSON, DANIEL B. BADGER, AARON C. BAGG, EZRA HENRY BAKER, A. D. BARNEY, O. P. BASSETT, CLARK BLICKENSDERFER, J. P. BROOKE, AUGUSTUS BROWN, J. B. BURLACE, FRED N. BURT, LE GRAND CANNON, C. W. CHORLEY, DAVID CLARK, JOHN P. CLASSEN, FRED H. CLOCK, JOHN STUART COONLEY, CHARLES E. CORY, ISAK DAHLE, A. L. DANIELS, CLINTON W. DAVIS, CARL P. DENNETT, J. VAUGHAN DENNETT, ANDREW DISTLER, LAURENCE P. DODGE, DONALD B. DOUGLAS, JR., GEORGES DROÜEL, G. W. DULANY, JR., ROBERT W. FERGUSON, JOSEPH N. FIELD, FREDERIC A. FISHER, ERWIN O. FREUND, WM. ARTHUR GALLUP, DAVID A. GASKILL, CELESTE GILLETTE, MACKENZIE GORDON, JR., NORMAN GRATZ, J. M. GRAVES, EDWARD W. GREW, E. R. GUDEHUS, CLARENCE E. HART, WALDEMAR HARTMANN, E. G. HOFFMAN, EDWARD J. HOLL, R. H. HOPKINS, WM. C. HUNNEMAN, RAYMOND ICKES, D. F. D. JENKINS, F. HEDLEY JOBBINS, N. E. JOHNSON, JACOB J. KAPLAN, W. K. KELLER, ERNEST L. KIMBALL, LOUIS B. KOHN, CHAS. KRATACH, AURILE LA ROCQUE, E. LEE LÉ COMPTE, J. HOWARD LEMAN, FORRESTER MACDONALD, LEWELLYN E. MACK, JR., HANFORD MACNIDER, A. R. MARTIN, JOHN MCCHESNEY, ROBERT H. MCLAUGHLIN, WM. J. MEINEL, CHAS. J. MOORE, CHAS. P. MYERS, WILLIAM F. NEVIN, D. P. NEWELL, WARREN OLNEY, JR., FRED B. OTIS, ARTHUR E. POST, THOS. C. POWELL, THOMAS H. POWERS, J. EDGAR RHOADS, E. W. RIECK, EDWARD P. ROBINSON, FRANK W. ROBL, JR., ANDREW RUSSEL, HORACE VAN ARSDALE SCOTT, THOMAS J. SEATON, PARKE E. SIMMONS, HOWARD SMITH, ROY L. STEELE, D. K. STEPHENSON, L. STRASSBURGER, H. SVENSON, NORMAN F. THOMPSON, JR., EUGENE B. UNDERWOOD, JOHN M. WADHAMS, CLARENCE R. WALTER, EDGAR WALTER, F. H. WHIPPLE, CLARENCE HORACE WICKHAM, J. ALLEN WILEY, WILLIAM WILKENS, HUGO WORCH, WILLIAM H. YOUNG.
Masters JOHN ARNOT MCCAULEY, THOMAS L. MEANS.